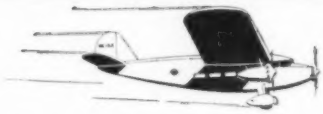
UNIVERSAL

MODEL AIRPLANE NEWS

JANUARY 20¢

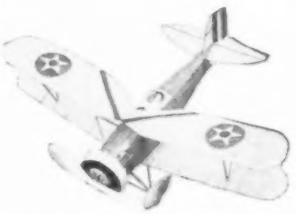
"THE ONLY MAGAZINE DEVOTED EXCLUSIVELY TO EXPERIMENTAL AVIATION"

MODEL BUILDERS!

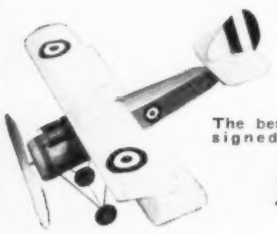


ARE YOU BUYING A KIT—OR A MODEL AIRPLANE?

Of course these kits contain all wing ribs, fuselage formers and other parts printed on balsa sheets. They also have cement, paper and the necessary material that goes in ALL kits. But we consider every MEGOW MODEL as a knocked-down model plane, shipped to you ready to re-assemble into a flying model. WHY? Because every kit is designed from a model that has been built, tested, balanced, and then duplicated line for line, and piece for piece, in the drawings and kits you buy. When you buy any MEGOW MODEL you get a proven plane ready for re-assembly.



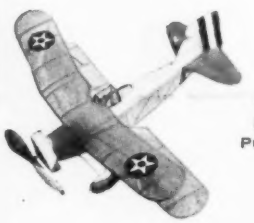
18" VOUGHT CORSAIR
This is the type plane being ordered by the U. S. navy.... **35c**
Postpaid



SOPWITH
The best English designed world war plane.
25c
Postpaid

FAIRCHILD CABIN PLANE
A beautiful 22½" model of a well known commercial job..... **75c**
Postpaid

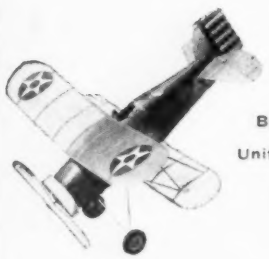
18" WACO CABIN
You can now build the Waco accurately from our kit..... **35c**
Postpaid



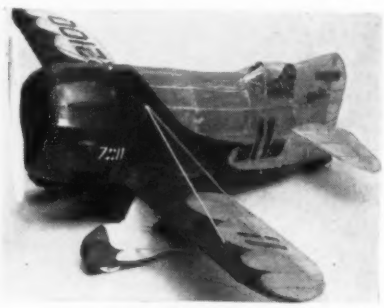
Megow's 13½"
HELL DIVER
Pride of the U. S. navy
25c
Postpaid

CURTISS PURSUIT
The latest army fighter. Does it look fast? Imagine a kit to build this 24" model **1.25**
Postpaid

18" BELLANCA SKYROCKET
Just think of it! A scale model of this famous plane..... **35c**
Postpaid

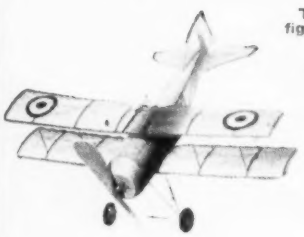


BOEING P12B
United States army fighter.
25c
Postpaid



GEE-BEE
A 24" flying model of the fastest land plane **1.50**
Postpaid

18" MONOCOUPE
Plans for this model scaled down from real plane..... **35c**
Postpaid



The French fighting plane.
SPAD
25c
Postpaid

It is an acknowledged fact among model builders everywhere that all Megow Models are accurate and complete. Regardless of whether you buy one of our 25c kits or our higher priced models, every kit is planned and designed with the same painstaking detail. Every Megow Model is a real bargain because of the liberal supply of high grade material included in every kit, which enables you to construct lifelike models that really fly.

(Above)
25c EACH
POSTPAID

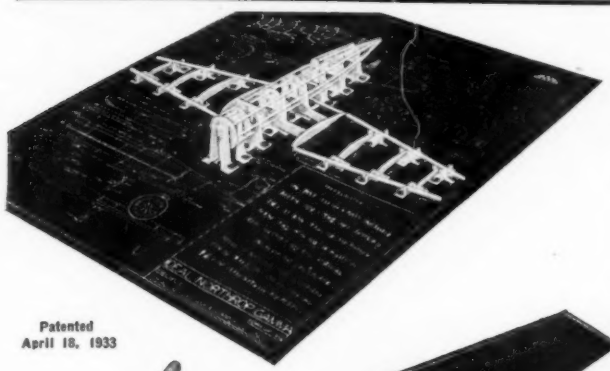
NRA MEMBER U.S. WE DO OUR PART

MODEL • AIRPLANE • SHOP

N. E. COR. HOWARD & NORRIS STS., PHILADELPHIA, PA.

DEALERS: Write for Details and Discounts

Your Christmas Money Cannot Buy More Model Building Pleasure than these IDEAL Models Will bring You!



Patented April 18, 1933

Bellanca Monoplane

Northrop Gamma

Build these Flying Models the Tru-bild way

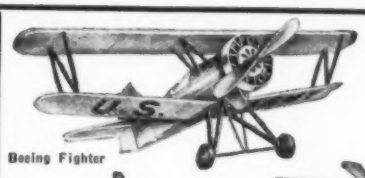
TRADE MARK REG U S PAT OFF

This new, patented method is the simplest, easiest and quickest way to construct a Model. Each Kit contains a set of forming jigs, or moulds, die-cut from cardboard. Simply thumb-tack these jigs in place on the full-size Plan. Place the balsa strips, bulkheads, spars, ribs and other parts into the proper slots and notches, and cement together. When dry, just lift the finished parts off the jigs. No chance for warping; no more twisted bodies; every Model true and accurate.

Look at these fine Models; two of the most popular Ships. Kit contains all materials and complete Instructions.

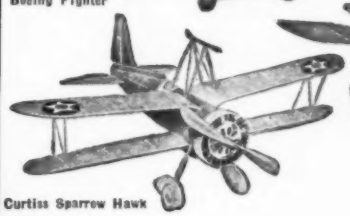
16 in. "Tru-bild" Flying Models
Northrop Gamma or Bellanca 50c
Each
Plus 10c Postage
(No Stamps Please)

New Bulletin Just Out-
Send a Stamp for Yours!



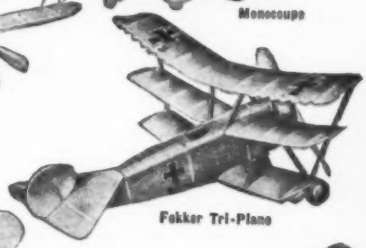
Boeing Fighter

Pick Yours from these 10 Models!

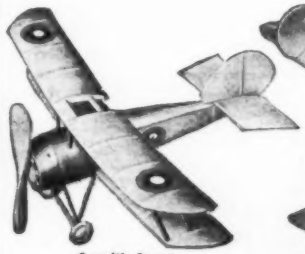


Curtiss Sparrow Hawk

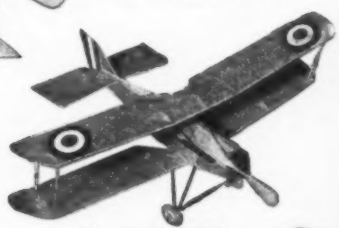
Monocoupe



Fokker Tri-Plane

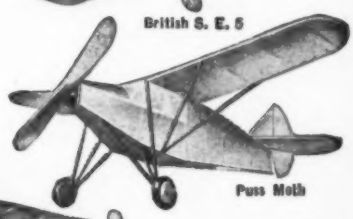


Sopwith Camel



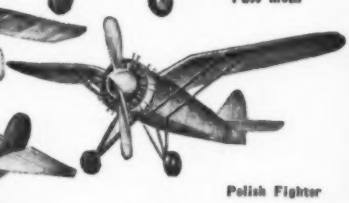
British S. E. 5

12 and 15 inch Flying Models



Puss Moth

Heath Parasol



Polish Fighter

Fokker D-VIII

Every Model is full-fuselage type, with constructed body, cambered wings, shock-proof landing gear, carved balsa prop, stamped motor plate and other fine features. Every one Guaranteed to Fly. Kits contain everything, including full-size Plan and Instructions. Pick yours from the Models shown above — Your Model Airplane money cannot buy greater value.

Your Choice of any 2 Kits 50c

Plus 10c Postage
(No stamps please)

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IDEAL AEROPLANE & SUPPLY CO., Inc.

20-24 West 19th Street, New York, N. Y.

Canadian Branch:—Canadian Model Aircraft, 3007 St. Antoine St., Montreal.
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Universal Model AIRPLANE News

VOL. IX *No. 6*

Edited by Charles Hampson Grant

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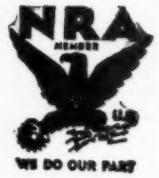

IN OUR NEXT ISSUE

News of the activities of the Junior division of the N.A.A. establishes a remarkable advance in the organization of model builders.

Making the Air Safe, by H. Latane Lewis II, tells of the developments of the many devices which are taking danger out of flying.

How You Can Build a Flying Scale Boeing-247, by Wm. H. Durand, plans for a twin propeller flying model of a modern transport.

Robert Morrison brings you more interesting information and plans of the latest planes.

Part No. 6 of the **Development of the Fokker Fighters**, by Robert C. Hare, tells you more little known history of a great series of World War planes.

Carl Goldberg gives you plans and instructions from which you can build the world record baby R.O.G. in **Keeping Pace with Model Science**, Part No. 3.

There will be other regular features as The Aerodynamic Design of the Model Plane, three view drawings, a book review and news from model builders in all parts of the country.

Order your copy of Universal Model Airplane News from your newsdealer now or send $2.00 for your year's subscription to this office, 125 West 45th Street, New York City. Canadian subscriptions, $2.00 per year. All other countries, $2.50.

Published Monthly by JAY PUBLISHING CORP., Myrick Bldg., Springfield, Mass.
Editorial and General Offices, 125 West 45th Street, New York City.
George C. Johnson, President. Jay P. Cleveland, Secretary
Jay P. Cleveland, Advertising Manager, 125 West 45th Street, New York, N. Y.
Entered as second-class matter June 5, 1929, at the Post Office at Springfield, Mass., under the Act of March 3, 1879.
Copyright 1933, by JAY PUBLISHING CORP.
Price 20c a copy. Subscription price $2.00 a year in the United States and its possessions; also Cuba, Mexico and Panama.
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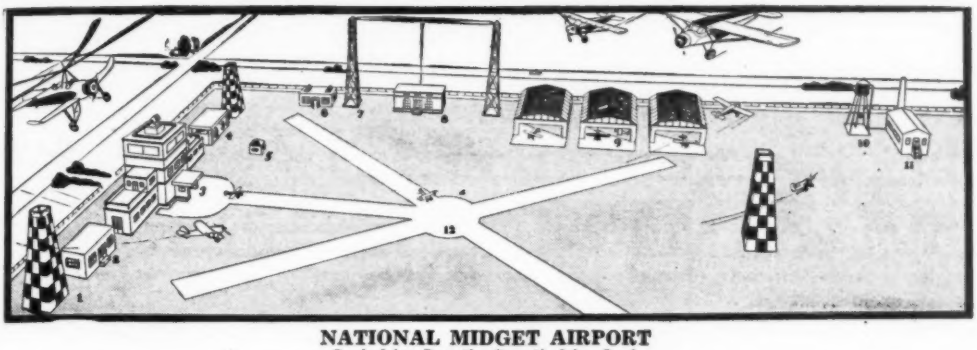
HOW WELL DO *YOU* KNOW YOUR AIRPORTS?

Here is a new,—interesting and constructive thrill—for every model builder.

WHAT A XMAS GIFT!!



NATIONAL MIDGET AIRPORT
Scaled for Detail—Detailed for Scale

Complete to the last detail, as the picture shows, or each kit separate as listed below.

1. Three Pylons	$.35
2. Post Office	.25
3. Administration Building	1.00
4. Gas Station	.50
5. Refreshment Stand	
6. Machine Shop	.50
7. Radio Towers	.50
8. Radio Station	
9. Three Hangers	.75
10. Water Tower	.50
11. Power House	
12. Field Mat	.50
13. Six Commercial Model Kits	.35
14. Six Sport Model Kits	.35

Airport construction kit, complete, as shown and listed above **$5.00**

Whether you prefer solid or flying scale models—here is a new constructive thought for every model builder and a thrill that will hold throughout the year.

KNOW YOUR AIRPORT. The layout of a modern field, its buildings and equipment.

National Midget Airport is so complete that you will feel yourself right in the atmosphere of the great airports of the country, as you build and arrange this colorful miniature layout.

The complete kit features ten buildings, three pylons and radio towers. A large ground plan 44" x 62" with its soft large green background, runways, aprons and location of buildings marked out. And, of course, a fleet of the most modern tiny replica planes that take their place about the field or are to be seen in their hangar.

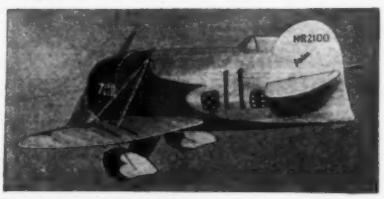
A full size, fully detailed plan with instructions guides you in the simple and accurate construction of each unit. The wood for each unit is cut to correct thickness, all details neatly printed out to assure you correct size of windows, doors and other detail. Glazing for all openings, an assortment of brilliantly colored lacquers and necessary quick drying cement to build a most complete and colorful airport. The only tools needed are a sharp knife and paint brush.

The Midget Airport is an ideal construction project for the individual, group or club. You can buy the complete kit for construction of the entire airport or any of the individual units, including ground plan, separately.

NATIONAL DESIGNED KITS OFFER A WIDE ASSORTMENT OF AUTHENTIC FLYING SCALE MODELS

National Kits have proven a joy to every model builder. Parents and friends assure themselves an appreciated gift when selecting National Model Construction Kits for Xmas Gifts. The accurate design, complete detail, ample and superior quality of all National Kits assures satisfactory results for the time and effort required to build. More than 50 models to choose from, including modern and war-time planes, sport and commercial ships. National Kits sell from 25 cents to $3.00 each, plus postage. The price of each kit is governed by its size, quantity and assortment of materials required to build a perfect flying scale miniature of the plane to be modeled.

You can be sure that every National Kit you buy, regardless of price, offers excellent value and contains many exclusive features of our own deveopment and not to be found in other kits.



25 in.-1" Flying Scale Model
Gee Bee Super Sportster.....$3.00
Plus postage ..... .25
12½ in.-⅛" Flying Scale Model
Gee Bee Super Sportster.....$1.25
Plus postage ..... .15

24 in. Lockheed Sirius $2.50
Colonel Lindbergh's favorite ship for private flights.
Plus postage ..... .25

Other 24 in. models:

24" Curtis Army Hawk	$2.50	24" Navy Vought Corsair	$2.75
24" Boeing P-12	2.75	24" Stinson Detroiter	2.50
24" Heath Parasol	2.00	24" Texaco 13	2.50
24" Laird 400	2.50	24" S. P. A. D.	2.25
24" Albatross	2.25	24" Nieuport Scout	2.25
24" Fokker D-7	2.25	24" British S.E.5	2.25
24" Fokker Triplane	2.50	24" Gee Bee 1931	2.50

Add for packing and postage on each of the above models 25c.

18" Curtiss A-8 $1.50
The Terror of the Skies
Other 18 in. models:
18" Navy Boeing F-4-B 1.50
18" Army Boeing P-12-E 1.50
18" British Cander Bomber..1.50
Add for packing and postage on each of the above models 15c.

NATIONAL MIDGET MODELS NOW SELL FOR 25, 35 and 50 cents each

Taylor Cub. A new midget sport model. Plus post. 10c **25c**

British S.E. 5. Easy to build—an excellent flier. Plus post 10c..... **35c**

Akron Fighter. The dirigible envoy..... Plus post. 10c **50c**

Fokker D-8. A famous war-time model Plus post. 10c **25c**

Other 25c models:
Plus post. 10c
Curtiss Robin
Puss Moth
Heath Parasol
Bellanca Liberty

S. P. A. D. Captain Rickenbacher's ship. Plus post. 10c **35c**

Other War-Time 35c models:
Plus post. 10c
Fokker D-7
Sopwith Camel

Fokker Triplane Plus post 10c **50c**

The 28 National Midget Flying Scale Models, as illustrated and listed above, presents the largest selection of kits offered at modest prices and which will appeal to every air-minded boy as a Xmas Gift.

Other 50c 12" Midget Models:
Plus post. 10c

(New) Hawk P-6-E
Boeing P-12
Curtiss Falcon
Curtiss Helldiver
British Hawker Fury
Polish P-6
Sikorsky Amphibian
Bellanca Airbus
Texaco 13
Gee Bee Sporster 1931
Lockheed Sirius
Lockheed Vega
Laird 400
Albatross
Pfalz
Nieuport Scout

LAIRD 400—GEE BEE SPORTSTER

NATIONAL SOLID SCALE CONSTRUCTION KIT (¼")

These kits are made from balsa wood. Each kit contains a fully detailed blue print and instructions, with all necessary material, including correct colored dopes and insignia, to build a beautiful replica model.

Gee Bee Sportster	25c	Nieuport Scout	25c
Laird 400	25c	S.P.A.D.	25c
Texaco 13	25c		

Add 10c postage for each of the models.

NATIONAL has gained a reputation for prompt service by making shipments of all orders the same day as received. **Please write or print plainly your name and address on order.** No orders accepted for less than 50c, plus postage. Remittance may be made in stamps up to $1.00. Otherwise, please remit by Post Office money order or check. All cash remittances are at risk of sender. We insure all packages without cost to you. Please note the amount of postage and packing as required on each kit.

National Bulletin

Write today for your free copy of National Bulletin, chuck full of interest to model builders. Complete price list of supplies and many models illustrated.

Dealers and Agents

National Kits and Supplies are in demand by model builders everywhere. Dealers featuring them are enjoying quick and profitable sales.
Write today for dealer's discount.

National Model Aircraft & Supply Company

23 Avenue "E," Bluebird Building, Dept. A-43
New Rochelle, New York

Canadian Distributor: St. John Bros. & Twomey, 644 Portage Ave., Winnipeg, Man., Canada.
Canadian prices 40% higher to cover duty.

MADISON!

...where "QUALITY," "VALUE," and "SERVICE" are more than mere words. Let us prove it to you! Send along your order NOW!

Every month in this book, we hammer away telling model airplane builders how good our merchandise and we ourselves really are. And we have backed up everything we have ever said in these columns and will continue to do so. Now would be a good time to check up on us. You'll be agreeably surprised.

NRA MEMBER U.S. WE DO OUR PART

2-in-1 KIT

Contains the around-the-world

Winnie Mae

(illustrated at right) and the

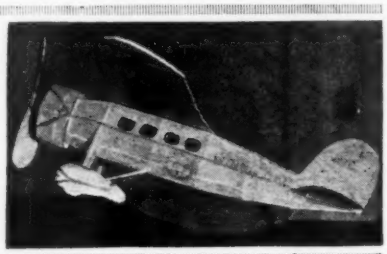
Transatlantic Bellanca

(at left)

Both 15" wing spans. Kit contains full-size plans, bulkheads, large tube of cement and a good supply of all other necessary materials needed to complete these two wonderful models. Send your order now!

75c

Add 10c for Postage



NOTE

All Balsa shown here in 18" lengths can also be had in 36" lengths, if requested. Half the quantity at the same price.

Balsa Wood

This balsa is clear, straight grained stock. It is strong, light, and free from defects. If hard or soft wood is desired, specify when ordering.

18" Lengths

1/16	x 1/8	.. 15	for 5c
1/16	x 1/4	.. 15	for 10c
1/8	x 1/8	.. 10	for 5c
1/8	x 5/16	.. 6	for 5c
1/8	x 1/4	.. 6	for 5c
3/16	x 3/16	.. 5	for 5c
3/16	x 1/4	.. 6	for 5c
1/16	x 1/16	.. 20	for 5c
1/4	x 1/4	.. 10	for 15c
1/4	x 3/8	.. 5	for 7c
1/4	x 1/2	.. 5	for 10c
3/8	x 3/8	.. 6	for 13c
3/8	x 1/2	.. 6	for 15c
1/2	x 1/2	.. 5	for 20c
1	x 1	 2	for 16c

40" Lengths

1/8	x 3/8	.....	5c
1/8	x 1/2	.....	6c
3/16	x 3/8	.....	8c
3/16	x 1/2	.....	10c

18" Sheet Balsa

1/32	x 2	 2	for 3c
1/16	x 2	 2	for 4c
1/8	x 2	 2	for 5c
3/16	x 2	 2	for 6c
1/4	x 2	 2	for 9c
1/2	x 2	 2	for 14c

36" Plank Balsa

2	x 6	.....	75c
2	x 3	.....	40c
1	x 6	.....	40c
1	x 3	.....	30c
2	x 5	.....	75c

Prop Blocks

1/2	x 5/8 x 5	 2	for 3c
1/2	x 3/4 x 6	 2	for 3c
3/4	x 1 x 7	 2	for 5c
3/4	x 1 x 8	 2	for 6c
3/4	x 1 1/4 x 8	 2	for 7c
3/4	x 1 1/4 x 10	 2	for 7c
3/4	x 1 1/2 x 11	 2	for 8c
3/4	x 1 1/2 x 12	 2	for 8c
7/8	x 1 1/2 x 12	 2	for 10c
1	x 1 1/2 x 12	 2	for 10c
1	x 1 1/2 x 14	 2	for 10c

Dowels

1/8	x 36	 1	for 3c
3/16	x 36	 1	for 3½c
1/4	x 36	 1	for 4½c
1/8	x 12	 1	for 1c

Bamboo

Genuine straight grained, no-knot TONKIN Bamboo. Strong and light. Splits easily. Doz.

1/16	x 1/4 x 11"	....9c
1/32	x 1/4 x 8"	....8c
1/16	x 1/16 x 9"	....5c

Japanese Tissue

A fine tissue for covering flying scale models. Strong, light, and takes dope well.

20 x 24	.....2 for 5c

Veri-Fine Tissue

One of the lightest tissues known. Excellent for endurance models, because of its extremely light weight.

20 x 15	.....7c

Colored Tissue

Just the thing for the new bright colored ships that are so popular nowadays. Red, Orange, Brown, Blue, Green.

20 x 24	.....2 for 10c

Wood Veneer Paper

Very useful in scale and flying-scale models. Strong, yet light enough to fly.

20 x 30	.....17c

Celluloid Wheels

Experience has proven these wheels best for flying scale models. Pair

¾" wheels	..... 5c
1" wheels	..... 7c
1¼" wheels	..... 9c
1⅞" wheels	.....11c

Bushings

for wheels.....4 for 5c

Thrust Bearings

Light, strong bearings. Hole is truly centered.

Large size	ea.	doz.
.035 hole	.....2c	20c
Small size		
.025 hole	.....2c	20c

Model Making Pins

Pkg. 5c

Music Wire

Strong, springy wire sold in this new, convenient manner.

1 ft. lengths—straight .014, .020, .028, .034

12 feet for 6c

Dummy Motors

The very thing for adding that realistic touch to scale and flying scale models. Extremely light. Nine cylinders.

1½" diam.	.....15c
3" diam.	.....30c

Rubber Thread

Careful testing has proven this rubber to be the highest in energy content per unit of weight. This means more turns and less breakage.

.045 sq.	....50 ft. for 12c
3/32 flat	...50 ft. for 25c
1/8 flat	...50 ft. for 25c
3/16 flat	...30 ft. for 27c

Washers

For indoor, outdoor, and flying scale models.

Large size, ¾ O.D.

Dozen 2c; Per 100, 15c

Small size, ⅛ O.D.

Dozen, 2c; Per 100, 15c

Clear Cement

The fastest drying, lightest and strongest cement on the market. Try some now. You'll be amazed at its marvelous properties.

1 oz. tubes	..... 8c
2 oz. tubes	.....15c
4 oz. cans	.....24c
1 pint cans	.....75c

Colored Dope

Highest quality pigmented dope. Do not confuse with inferior grades. Leaves a smooth even color upon drying.

Blue, Red, Yellow, Orange, Silver, Black, Olive Drab.

2 oz cans	.....18c
4 oz. cans	.....30c
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For thinning out liquids.

2 oz. cans	.....16c
4 oz. cans	.....24c
1 pt. cans	.....75c

ALUMINUM ITEMS

Drag Rings

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1⅛" diam.	.....15c
2" diam.	.....20c
2¼" diam.	.....25c
3" diam.	.....30c

N.A.C.A. Cowlings

No dummy motor needed when this cowling is used. Has a hole for thrust bearing in the nose.

1½" diam.	.....15c
2" diam.	.....20c
2¼" diam.	.....25c
3" diam.	.....30c

Aluminum Tubing

.010 wall thickness ft.

1/8	O.D.	.....7c
3/16	O.D.	.....8c
1/4	O.D.	.....9c

Aluminum Leaf

Real sheet aluminum yet almost as light as paper. Makes a beautiful covering job.

.0003 thick

3½" wide—5 ft. for .05

12" wide

Sheet Aluminum

.003, 15c ft.; .005, 20c ft. .010, 25c ft.

Insignia

U. S. Army and Navy type Improves the appearance of models by 100%. Each sheet contains 4 stars in circles for the wings, and red, white and blue stripes for both sides of the rudder.

Sheet

1"	diam.	.....3c
1½"	diam.	.....4c
2"	diam.	.....5c
2½"	diam.	.....6c

Sandpaper

Large Size Sheet.....5c

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This all-balsa model plane has a double surfaced, high lift wing, 30-inch span, all-balsa fuselage, extra strong landing gear to withstand the shocks of outdoor flying, and a large, wide-bladed propeller to keep it up for long endurance flights. Designed along accurate engineering lines. Kit contains complete plans and instructions, stamped ribs, large tube cement, 1 oz. bottle clear dope, pair celluloid wheels, and all materials needed to complete the model.....

75c

Add 10c for Postage

3-in-1 KIT

Plans and materials for the construction of 3 separate flying stick models. There are 3 fuselages, 3 wings and 3 propellers. The models are a HIGH-PERFORMANCE R.O.G., a SENIOR R.O.G., and a new 11 MINUTE INDOOR TRACTOR. The retail price for these 3 models is less than some companies are asking for the last plane alone.....

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Add 10c for Postage

Plans for 3-in-1 Kit — 10c

OUTDOOR TWIN PUSHER

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75c

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"Texaco 13".....25c	Cabin Tractor.....10c	R.O.G. 3 drawing consisting of Sr.
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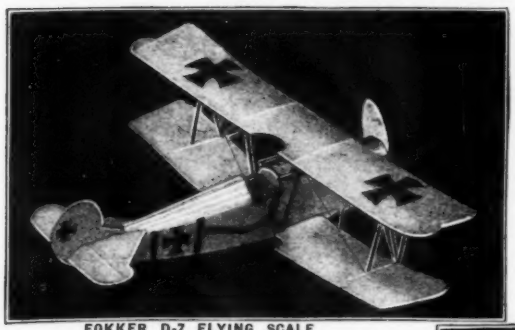

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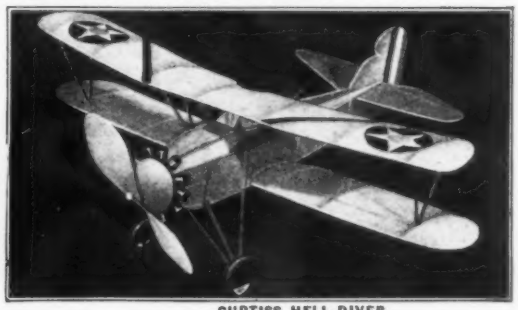

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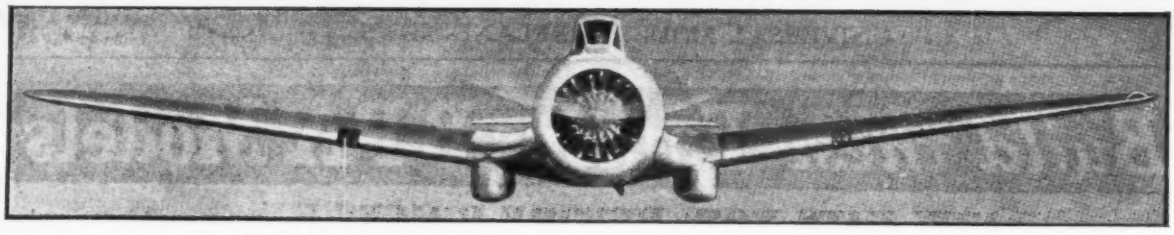


The Clark GA-43. One of the latest ten passenger planes. It cruises at 170 m.p.h.

On the Frontiers of Aviation

The First Article of a Series Giving Intimate Details of Airplanes That Are Leading the World in Aviation

By ROBERT C. MORRISON

NINETEEN hundred and thirty-three has undoubtedly been one of the greatest years in the history of aviation as far as the development of high performance aircraft is concerned. Many new planes have been designed during the year that have shown astounding performance never before heard of in the annals of aviation.

Among the first of these super-planes of 1933 was Frank Hawk's Northrop "Gamma," which was closely followed by the introduction of the Curtiss "Swift," Curtiss "Condor," Pitcairn cabin autogyro and the General Aviation's Clark GA-43, similar to the one described in this article. Next came Gerard Vultee's (former designer of famous Lockheed ships) excellent low-wing transport, the latest version of the Martin bomber, the Boeing low-wing transport, the Stinson "Reliant," the numerous Waco models, the Stearman 80 and a host of other now popular planes.

With this great number of new planes it seems incredible that any more designs could be produced, but this is not so. The newly formed Lockheed Aircraft Corp. has announced the production of a new low-wing transport known as the "Electra."

Douglas has recently produced a new large transport as has its closely related company, The Northrop Corporation. This new plane, built by the Northrop concern and known as the "Delta," was designed by the famous Jack Northrop and is a direct decendant of the Northrop "Gamma."

Mr. Granville, designer of the Gee Bee racers, has announced that he will soon have a new eight passenger transport on the market that will be very similar to the Gee Bee that Jimmie Doolittle used in establishing the former world's land plane speed record of 295 m.p.h.

Uppercu-Burnelli is busy designing a plane for Clyde Pangborn for a non-stop refueling flight around the world. The plane will have an 8,000 mile cruising range, a greater range than any plane built heretofore.

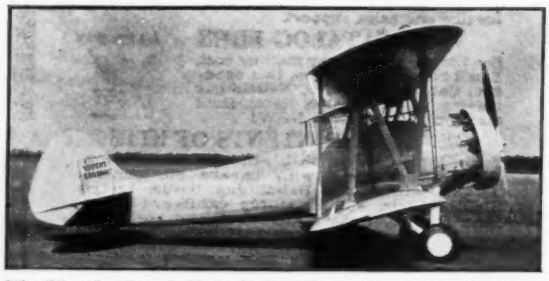
B/J and Great Lakes have been building some excellent ships for the Navy as has Consolidated Aircraft Corp., its latest being the P2-Y2, a twin-engined flying boat.

Fairchild has announced a new ship for the sport plane field. It will be similar in design to the F-22 but much faster.

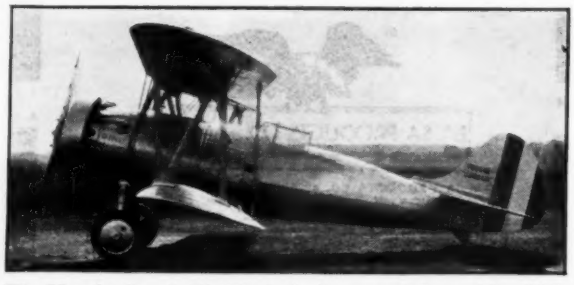
Other designs are now on the boards of the leading aircraft manufacturers and we may see still greater developments in the year 1934.

All of these airplanes possess very fascinating lines and should be of very much interest to the model builder. It is, therefore, the purpose of this article and those to follow to acquaint model builders with the latest developments of the aeronautical industry in order that they may be able to build the most up-to-date models.

These articles will contain three-views, photos and descriptive matter of the aforesaid planes and many others in the near future.



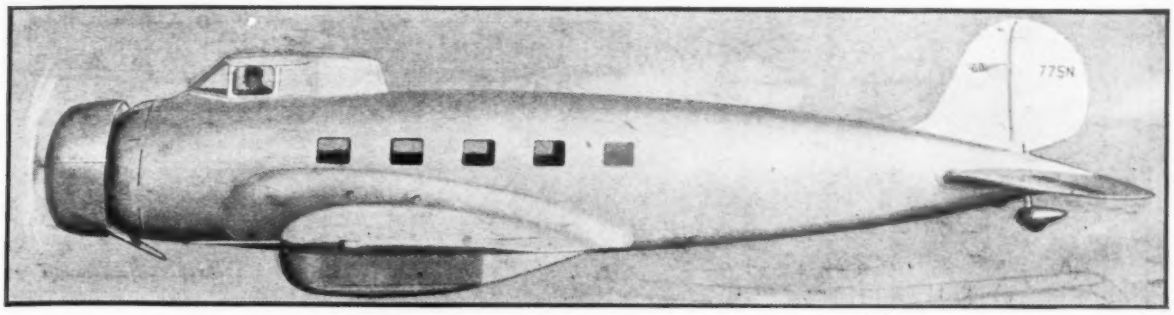
The Vought Corsair V-65-C. A high speed two seater fighter. This ship is in great demand by foreign countries



The Vought Corsair V-80P. A single seater fighter with a high speed of 190 m.p.h. with full military load

The Latest Vought Corsairs (V-65, V-80)

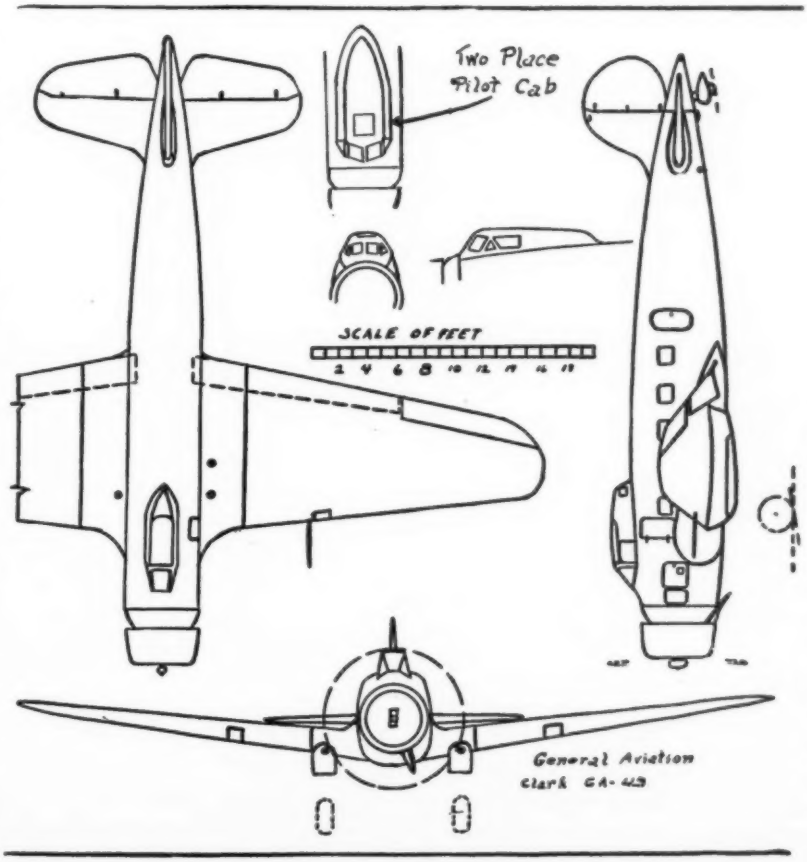
Few types of military aircraft have achieved the wide acceptance that has been accorded the "Corsair." More than 400 airplanes of this type have been delivered to the governments of the United States and other countries for service with the military and



How the Clark GA-43 looks from the side. Note the smooth lines that make for high speed

naval air forces. Standard observation airplane of the United States Navy, the "Corsair" has been thoroughly proven through war and peace-time service all over the world. It served for four difficult years in Nicaragua. It accompanied the Marines to China. It flies at every Naval Air Station from New York to Honolulu. It is always with the fleet operating from the heaving decks of aircraft carriers or hurtling from the catapults on battleships and cruisers. It has won a reputation for performance and reliability that is unsurpassed.

The "Corsair" known as the V-80 has been developed to meet the conditions encountered in many foreign countries having relatively small air forces and few airdromes, which are often widely scattered and difficult of access by land. For reasons of economy, it is highly desirable to keep the number of types of aircraft at a minimum, and the principal offensive aircraft in these air forces, therefore, are single seaters and two seaters, which between them fulfill the functions of pursuit, observation, bombing, and attack aircraft. Moreover, because of the scattered and inaccessible location of airdromes, transportation of spares becomes a difficult problem, and interchangeability of parts is important so that the quantity of spares may be kept at a minimum. Still another controlling factor, also due to the scarcity of airdromes and the unfavorable terrain, is the necessity for long cruising range to insure maximum mobility of operating units.

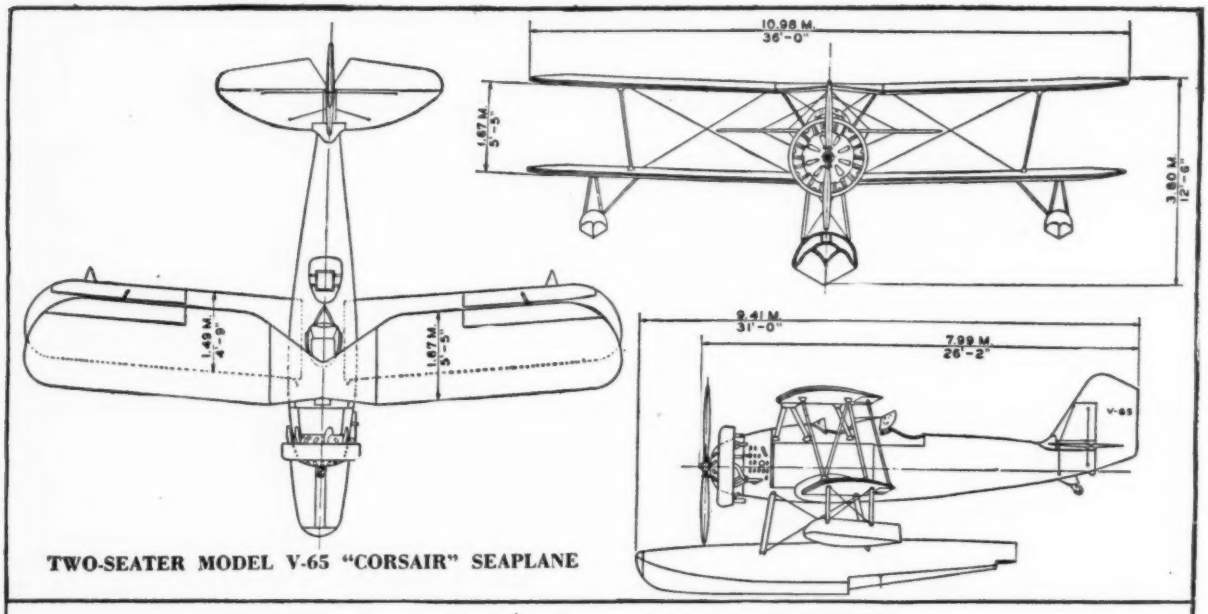


For those air services already equipped with two-seater "Corsairs" (and this includes the governments of eight countries), the single seater V-80 fulfills these requirements in a highly satisfactory manner. It is a direct development of the two-seater "Corsair," using the same skeleton fuselage, wings, tail, landing gear and many other items of equipment, all of which are interchangeable between the two types. It inherits the high performance and maneuverability characteristics that have made the two-seater "Corsair" internationally known. It is heavily armed, carrying four fixed machine guns and two bomb racks so that in emergency it can perform attack or bombardment functions in addition to pursuit. The fuel capacity is 173 gallons, far more than the usual single-seater and sufficient for a cruising range of more than 800 miles.

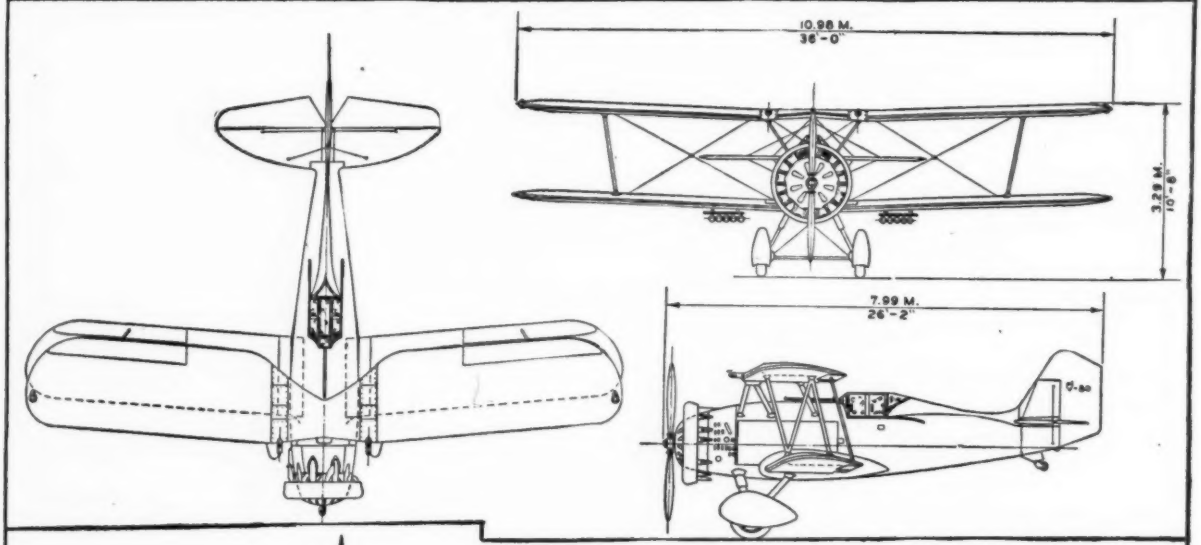
The power plant is the Pratt & Whitney T1C-1 "Hornet," rated at 700 h.p., at 2000 r.p.m. at sea level. It is cowled with an anti-drag ring and provided with a Hamilton Standard metal propeller and Eclipse electric starter.

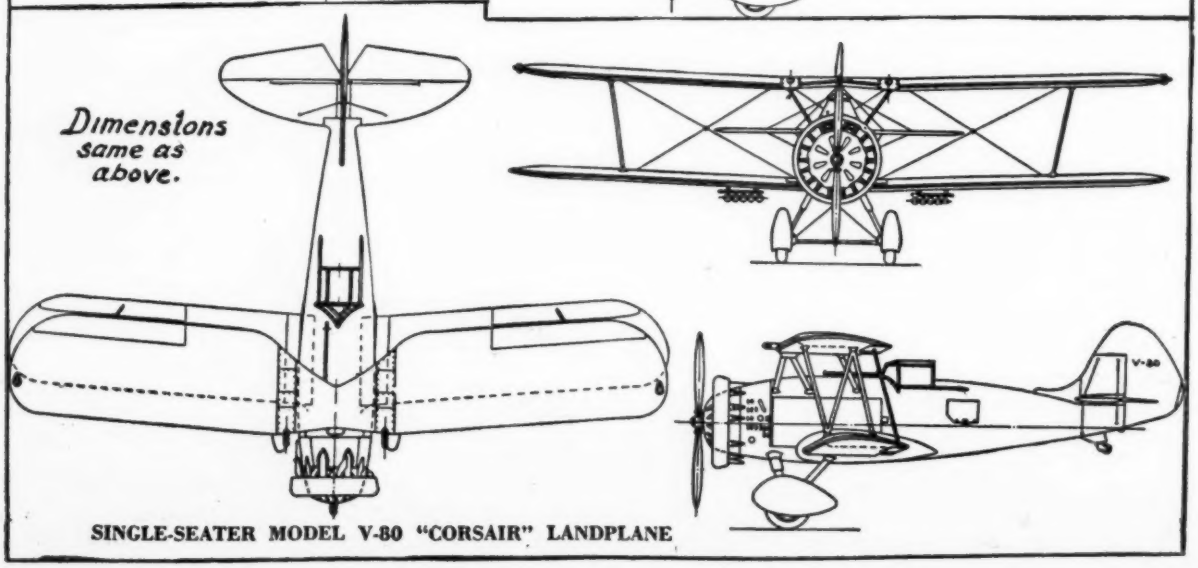
The V-80 is equipped with a transparent cabin for the cockpit, providing maximum speed and insuring comfort for the pilot without impairing his vision. The four guns all fire directly forward, two being mounted in the upper center section and two in the fuselage, synchronized to fire through the propeller circle.

(Continued on page 40)



TWO-SEATER MODEL V-65 "CORSAIR" SEAPLANE



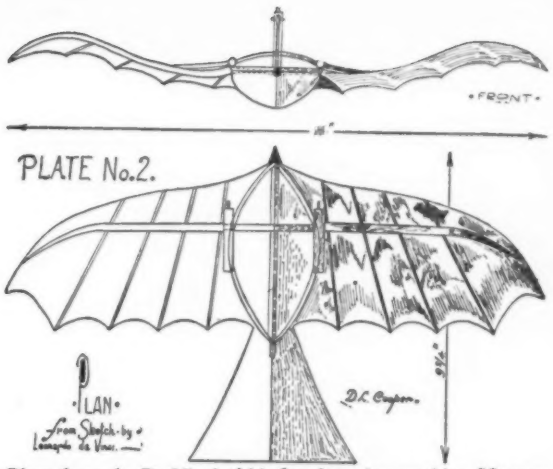


SINGLE-SEATER MODEL V-80 "CORSAIR" LANDPLANE

How The Aeroplane Was Created

How the Aeroplane Grew from a Dream to an Actuality—Part No. 1

By DAVID COOPER



Plans drawn by Da Vinci of his flapping wing machine. He was 200 years ahead of his time.

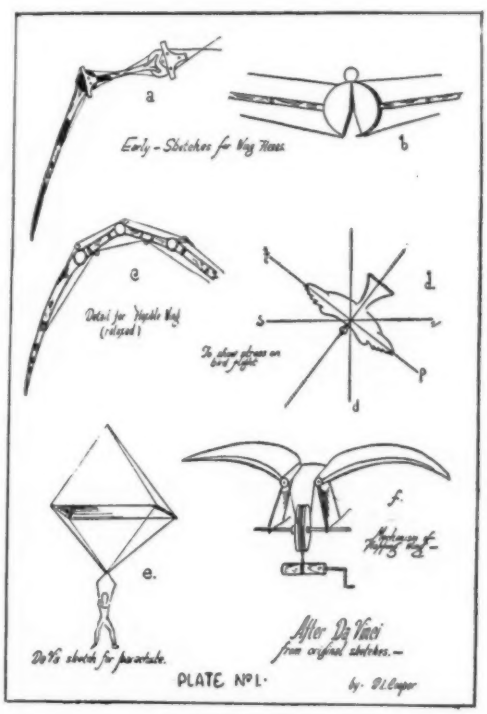
EARLY history records attempts by man to conquer the element, air. Many legends, too, come down to us from many lands and languages, relating man's efforts to fly. Egyptian stone relics show winged men; even animals not so endowed by nature are depicted with wings. They evidently bear some relationship thus far unexplained to these efforts of man at conquest.

One recalls the myths of Pegasus, the flying horse; Icarus, son of Daedalus who, following his father's footsteps, constructed wings of feathers held together with thongs and beeswax, flew too close to the burning sun and the heat melting the wax, he fell into the sea and was drowned. There are others not so well known in the legends from the Incas; of one Agar Utso who grew wings and flew to the sun, this probably being closely related to the Inca sun worship; of the Mahabarata of Krishna who rode in a great chariot of fire; and more likely possible, the fable of Taranto, who in 400 B.C. supposedly constructed a mechanical wooden pigeon or dove.

From this stage, nothing of importance is recorded until the time of Roger Bacon in 1250. He is without question the first of a line of a speculative group of those interested in flying. Though he did little or no practical work, he should be remembered for this effort which was followed by others with greater success.

There occurs here and there some records of flights by such names as Muller, Allard, Besnier, and the Marquis de Bacqueville, but with no definite progress made or success attained. It is therefore safe to say that the first really important thinker in the line of aviation was Leonardo da Vinci. Da Vinci, the great artist, was the first real student of flight. He did more than speculate, as will be seen from the very definite ideas which sprang from his mind.

His studies and conclusions gave a mighty impetus to the new and growing science and his influence was to be more strongly felt as it progressed. He firmly believed that flight was possible and practical with the use of human muscles alone and covered at great lengths, in written form, the subject of wings to be connected to the human body. His treatise, "Flight of Birds," in which he observed closely the structures and manipulations of birds' wings, was excellent and most complete. This was far ahead of his day and time and much of this work had to be rediscovered long after his treatise was forgotten.



Sketches of Da Vinci showing devices for flight with flapping wings.

Referring to Plate No. 1, a, b, and c show sketches from authentic works of Da Vinci's plans for wings on the flapping wing principle. They were jointed to allow an operation as nearly bird-like as possible, and operated on cables through eyelets or pulleys. d shows how his studies carried this to such details as the stress on birds during flight. e shows his sketch for a proposed parachute differing not greatly from those in use today. f shows a more ambitious method of wing operation on his earlier principle.

Plate No. 2 is a plan drawn up from a sketch design by Da Vinci of his ornithopter wing with a boat-like nacelle suspended between the wings for the operator. The wings operated with a lever pull which

(Continued on page 42)

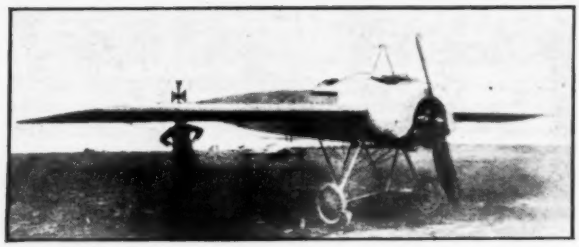


Fig. No. 4. Fokker E. III. Immelmann's special 3 gun ship in which he gained two victories

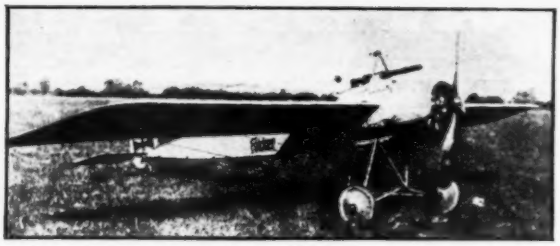


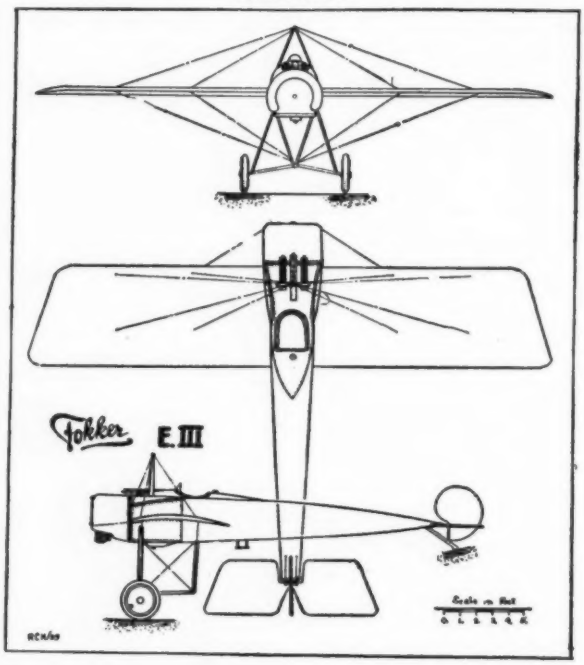
Fig. No. 1. Fokker E. I. The first plane to carry a synchronized machine-gun. Boelcke won his first victory with it.

The Development of the Fokker Fighters

Boelcke and Immelmann Make History With the First Planes to Mount Synchronized Machine-Guns.

By ROBERT C. HARE

PART NO. 5



DURING the trying months of the winter of 1914-1915, all industries were taxed to the capacity of their human workers. Likewise, the newest of industries at that time, aviation, was forging ahead in leaps and bounds. It can truthfully be said that aircraft designers were sprouting by the thousands. On both sides new types were being built, some in the strictest secrecy; others were nothing but copies of successful contemporary designs.

Finally the types became more standardized, Morane, Fokker, Farman and Voisin aeroplanes became quite common over the battlefields. When two planes of warring nations approached one another, they politely avoided their opponents and went on their way. But one day a gentleman with a shotgun and a perverted sense of humor, calmly flew to the side of his unsuspecting enemy and took a pot shot at him. From then on family heirlooms, den pieces, carbines and the most motley array of firearms began daily flights with the maddening pilots and their observers. No tactics were thought out, they simply flew alongside one another and exchanged broadsides not unlike two battleships.

However, all combat was not concentrated on the use of rifles and old pieces. Behind the lines a dramatic fight that was to result in revolutionizing air battle was slowly being fought. Perhaps three descriptive scenes could best illustrate this most important period in all air fighting; the period of development and perfection of the synchronized aeroplane machine-gun.

The first scene would take us behind the French lines. On the line we see a little Morane scout, new and untried. A young officer is busily attending to some detail of the propeller. His name is Roland Garros. On closer examination we find that the plane is equipped with a machine-gun fixed to the upper cowling and that the propeller is equipped with steel plates to protect it from the lead slugs. This was an actual hit-and-miss proposition!

For a short time these arrangements brought considerable anxiety to the pilots of the German Aviatik scouts then in use. But their fear was short-lived. One day a Morane with armored propeller and machine-gun was forced to land. This untried system of letting pass those bullets fortunate not to hit the propeller had failed. The slugs that did not pass had pounded the propeller to shreds. However, this was an idea, and the German High Command ordered an investigation of the possibilities of adopting a similar rig for the Fokker E. I. monoplanes just delivered to the army. Thus ended scene two.

Scene three presents the milestone of aerial warfare. Fokker was called to watch demonstrations of an armored propeller on one of his fast monoplanes. Several tests were made, but each one resulted in a battered propeller. Finally the High Command called upon Fokker for his opinion in the matter. Upon receipt of his answer, Fokker was given an old air-cooled parabellum infantry machine-gun with orders to figure out a way to safely shoot bullets

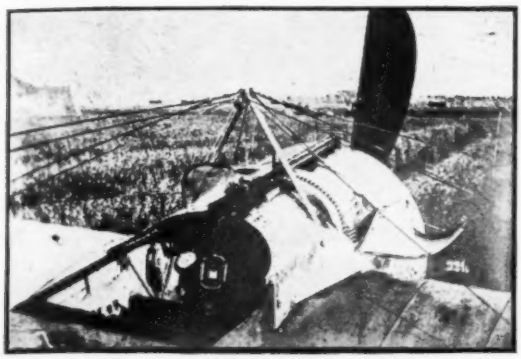


Fig. No. 2. The synchronized parabellum infantry gun on the plane with which Boelcke won his first victory

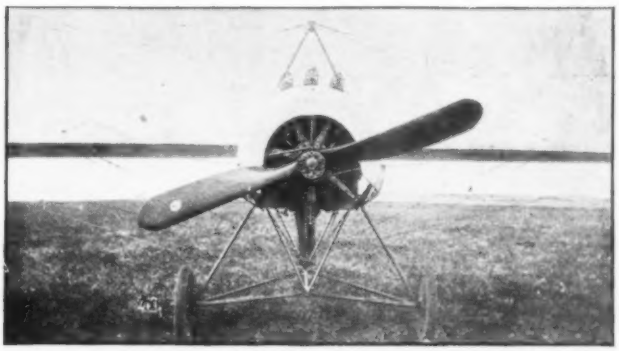


Fig. No. 5. Immelmann's Fokker E. III showing the three machine-guns mounted above the engine cowl

between the blades of a rapidly revolving propeller.

On a Tuesday afternoon, Fokker left Berlin with the gun tucked under his arm and a ticket to his factory and apartment at Schwerin. After making up plans and drawings, discarding old ideas for new ones, Fokker finally hit upon the basic idea. Within forty-eight hours, Fokker had the entire mechanism worked out, and that Friday he walked into the Army office at Berlin with the gun and his plans.

This first gear was simple, consisting of a knob on the propeller hub which struck a cam that in turn pulled the trigger. When the motor turned over the normal speed of 1200 r.p.ms. the Fokker device fired 600 shots a minute. Even at this point the battle was not half won. Fokker had to convince the very conservative German military mind that a charging aeroplane and a synchronized machine-gun were better than a whole troop of cavalry. Most of these men were from the cavalry.

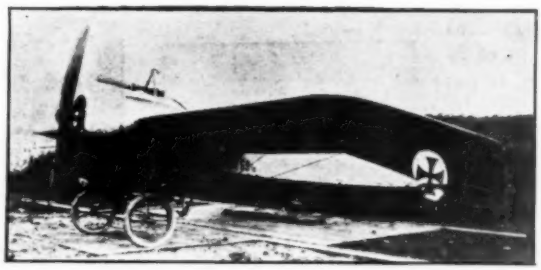
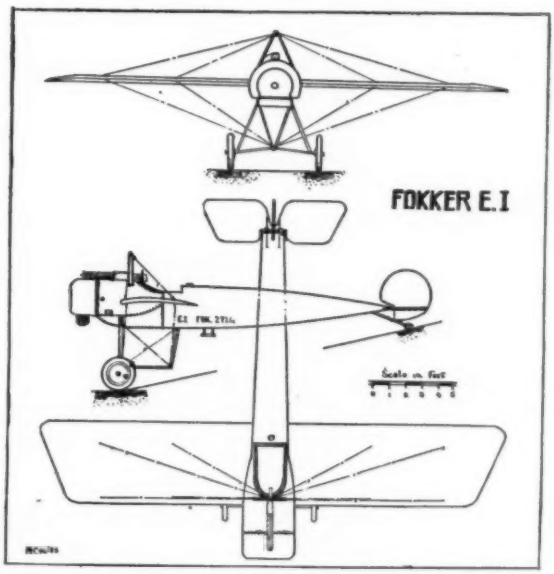


Fig. No. 3. The Fokker E. II. The first Fokker plane to be designed originally as a gun fighter. It was larger than the E. I.



In defense of his belief in his machine-gun synchronizer, young Fokker ordered some old wings placed on the ground as targets and proceeded to shoot them up during a series of power dives. Still unconvinced, the officers complained that Fokker had fired bursts of ten bullets only and for this reason there was a catch in it. After repeated diving at the wings, firing various numbers of bullets in groups, the stern German mind was no more ready to accept the device than it had been before.

Giving Fokker one last chance to prove his gun practical, the High Command ordered him to show that the gun could bring down an enemy aeroplane. The story of Fokker's refusal to shoot down an unsuspecting French Voisin is too well known to repeat here. After landing Fokker argued that he was a citizen of neutral Holland, therefore he had no rights to destroy French property. He also took into consideration the terrible escapes he had had with death, which would be experienced by the Frenchmen if he chose to shoot them.

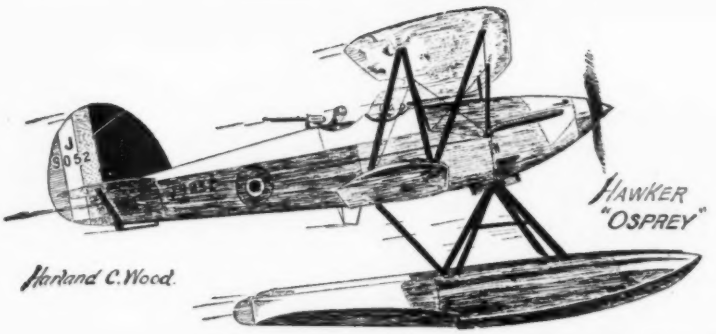
The brief argument continued, until it was agreed that young Lieutenant Oswald Boelcke, later destined to become Germany's first ace should take the plane up and be assigned to Fokker's job. After his third flight over the lines, Boelcke brought down his first plane. The success of this pilot so soon after having obtained the aeroplane convinced the German headquarters that the device was a success and immediately all planes were fitted with the new device.

Second to receive a new Fokker E. I. with synchronized machine-gun was Lieutenant Max Immelmann. Within a week he had duplicated Boelcke's success and within a month eight or nine new Fokker monoplanes of this type were flying at the front. French and English casualty lists grew appallingly and there seemed to be no solution. However, in order to keep the gun secret, the German pilots were not allowed to venture beyond their own lines, which accounts for the fact that most air fighting during the war took place behind the German trenches. That is the story of the most important months in the history of aerial fighting.

(Continued on page 46)

AIR-WAYS

HERE AND THERE



What Readers Are Doing to Increase Their Knowledge of Aviation. "Air Your Ways" Here.

YOU will be glad to see that Harland C. Wood, of Lyndonville, Vermont, has staged a comeback by supplying us with an extremely fine drawing of the Hawker Osprey.

Things seem to be picking up, for recently Bill Atwood's gas model, shown in picture No. 1, picked itself up off the ground for a flight of 26 minutes, 30-2/5 seconds. This comes pretty close to the world's record held by Maxwell Bassett. The world's record time is 28 minutes, 18 seconds. Atwood lives at 4586 Lime St., Riverside, Cal.

As you can see by the picture, this little ship is extremely well built. The span is 8′ 2″ and it weighs a little over 7 pounds, ready for flight. The rotary valve two cycle engine of 30 c.c. displacement turns a 22″ propeller at 3200 r.p.m.

It is with pleasure that we notice great activity in the gas model field. Evidently this is one of the finest gas ships that has been produced so far.

Pict. No. 2. Glen Rymer's 11 oz. flying scale Boeing-247.

Pict. No. 1. Bill Atwood tunes up his "gas" model for his 26 min. 30 2/5 sec. flight at March Field, Calif.

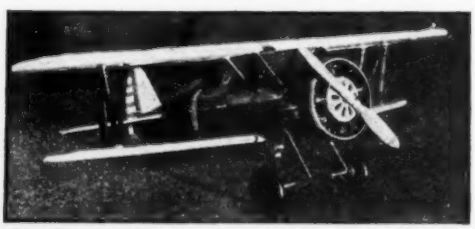
Pict. No. 3. A model Aeronca makes a fine flight for its builder, Neil Secor.

Glen Rymer, of 1241 Jefferson Ave., Akron, Ohio, sends in picture No. 2 of his Boeing-247. This is a slick looking job, especially as it is a flying scale model. It is much more difficult to make such a ship look neat and accurate. It weighs 11 oz.

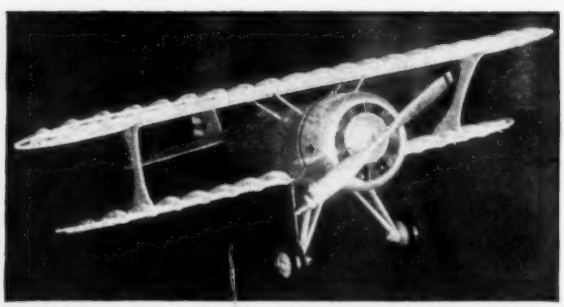
Picture No. 3 shows Neil Secor's Aeronca C2 in actual flight. You will note that this ship is equipped with pontoons. Secor lives at 2619 James St., Syracuse, N. Y.

Charles W. Hyde, of 20 W. Baltimore St., Lynn, Mass.,

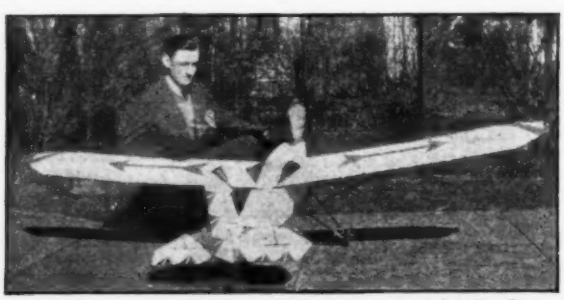
Pict. No. 4. Charles Hyde's Stinson in flight.



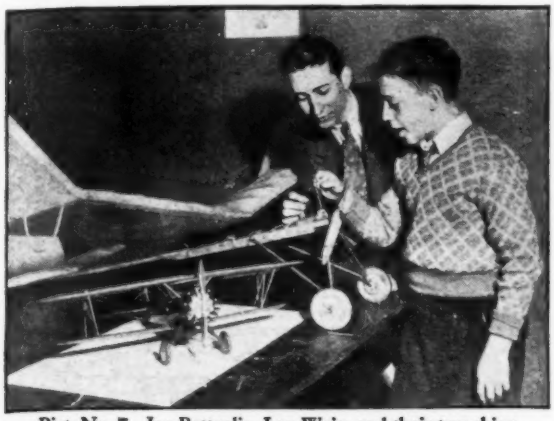
Pict. No. 15. Bill Herbert's winning Boeing-P-12E. (C.S.M.E.)



Pict. No. 5. Here is a neat job of construction. An exact flying scale Laird Speed Wing by K. Pouch.

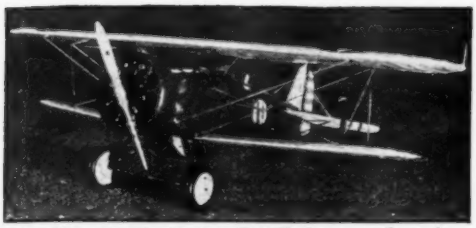


Pict. No. 6. An eight foot rubber powered model that flies well, built by Charles Pelton.



Pict. No. 7. Joe Battaglia, Leo Weiss and their two ships.

Pict. No. 11. Waldron Schantz, Bob Buck and George Viehman judge contest.



Pict. No. 16. The Boeing P-12E that won first place at Columbus, Ohio, for Bob File

Pict. No. 9. Clifford Hines' Blue Bird Racer chases clouds.

Pict. No. 13. Ben Badenock with his eleven foot rubber powered model.

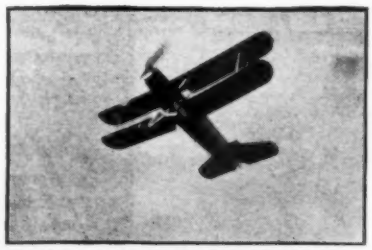
ture instruments, doors, and even a "blue eagle" emblem. It took Hyde 115 hours to complete it, so, you can see it is a finished job. It has made 116 flights, some of which have been 400 ft.

In picture No. 5 we see the completed framework of a Laird Speed Wing, built by K. Pouch, of New Brighton, N. Y. It has a span of 22" and is built to exact scale with full details. It embodies special crash proof features in the landing gear and cabin struts. It flies about 400'.

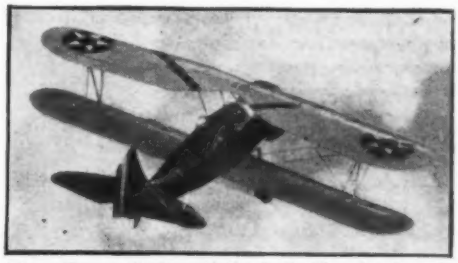
Picture No. 6 shows a very unusual ship, probably one of the largest rubber powered models ever built. Charles D. Pelton, of 992 Pine St., San Francisco, Calif., is the designer and builder of this ship. It

(Continued on page 36)

turns in picture No. 4 of one of the neatest jobs we have ever seen. The picture shows his flying scale Stinson winging its way across country. This ship was made from plans in this magazine and is equipped with an automatic stabilizer adjustment. This insures a fine glide and a happy landing. It is truly a scale model as it is equipped with seats, minia-



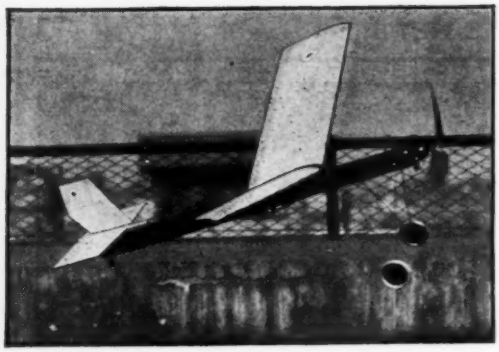
Pict. No. 10. Alan Booton's flying Douglas O2-H.



Pict. No. 8. A beautifully built Vought Corsair 03U-4, scale model by Norville Schields.

Pict. No. 12. Outdoor Bamberger Contest winners with Lt. Aldworth, judge.

Pict. No. 14. Contest director Konkle (left) with winners at C. S. M. E. contest.



Pict. No. 4. A five foot compressed air job that flies consistently for 55 seconds. Built by H. R. Tanner, (M.F.C.).

Pict. No. 3. City Model Airplane Club of Brisbane, who refuse to stoop to the use of balsa wood. They use hard wood.

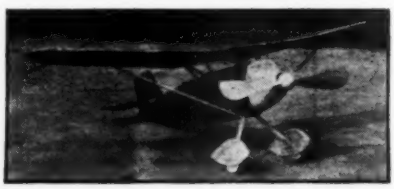
Model News From Other Countries

IT SEEMS to be a trait of human nature that the more people have, the more they want. This fact is brought to our mind upon reading a letter from Allan R. Rowe of 60 Wairiki Road, Mt. Eden, Auckland, New Zealand, which we received recently. It has been a regular song of model builders in this country that our indoor flying events have not been given a fair chance because of the lack of suitable flying space. All we have in this country, at least in New York, are 2 or 3 armories which measure 100 feet to the roof, 300 feet wide, and at least 300 feet long. It is very difficult for our model builders, it seems, to obtain desirable flights in this small space. The foregoing will not be taken literally by readers, I hope, it is merely the essence of the complaints which we often hear from model fliers.

Now, on the other hand, let me tell you what Allan Rowe has to say about the place in which they fly their indoor models. It seems that they are quite content and make the best of the situation. He says casually, "We are handicapped here in respect to our halls. The one in which we fly is 40 feet in altitude and 45 feet in diameter. However, I am confident of doing more than I have done with only a bit of luck." It is very difficult for us to imagine an American boy showing such excellent sportsmanship as this. The answer is, in our opinion, that they have had too much and too few difficulties to contend with. It is a fact that the more difficulties we have to encounter the more satisfied we are with what we have.

It is interesting to know what some of these young men in Australia would do if they had the opportunity to fly in one of our New York armories; especially when Rowe tells us that he holds the Indoor Fuselage records of New Zealand with flights of 2 minutes, 35 seconds and 2 minutes, 30 seconds in hand launched and R.O.G., respectively. We sincerely thank Rowe for writing us and telling us of activities on the other side of the world.

He also says that the Capt. Page Baby Racer, shown in picture No. 1 holds 4 New Zealand records; the Indoor and Outdoor hand-launched and R.O.G. events. It is a flying scale model which weighs 3/8 oz. Its highest duration so far is 67 seconds hand-launched outdoors, and 56 seconds hand-launched indoors. It has made an unofficial flight of 84 seconds.

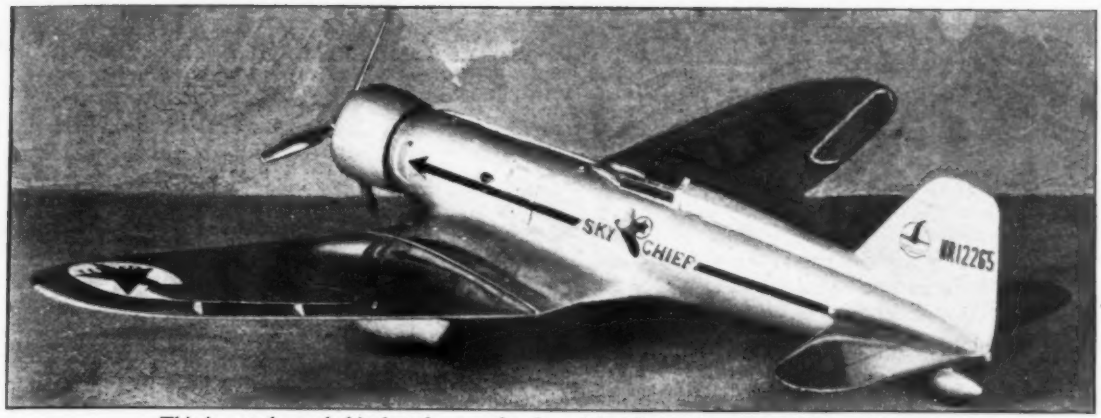


Pict. No. 1. This Capt. Page Baby Racer built by Allan Rowe holds four New Zealand records. It weighs 3/8 oz.

An interesting letter also comes from A. Dillon of 52 Canturbury Rd. St. Kilda, Melbourne, Victoria, Australia. Dillon modestly tells us the longest flight which he has made so far is only 9 minutes outdoors, but he is still hoping. The official Victorian Outdoor record is 27 minutes. We would say that a 9 minute flight is not to be laughed at among the best of them. He gives some interesting news. The Indoor record, though rather low due to poor flying halls, is 5 minutes 23 seconds. Dillon seems to be interested in constructing biplane models. Though we have lately been

(Continued on page 34)

Pict. No. 2. The second annual Model Plane Exhibit, Sidney in full swing. The scale model display is in the foreground.



This is not the real ship but the completed model. All details are carefully carried out

The Northrop Sky Chief in Detail

How This Great Plane Was Born and a Complete Description with Plans from Which You Can Build It

By JOSEPH BATTAGLIA

FRANK HAWKS, the famous speed flier, one day looked into the future and jotted down on the back of an envelope the specifications for a dream ship he visioned there.

His requirements were pretty high but then he had a wealth of experience in flying his Texaco 13 over thousands of miles, breaking records both in this country and abroad, and he had a firm belief that his dreamship should and could be brought down "out of the clouds," so to speak, into actuality.

He wanted a super-speed, mail-express type ship, carrying fuel for 2,000 miles (he had more cross-country flights in mind), cruising speed at 85% of power, 220 miles per hour minimum, landing speed with one hour's fuel using dump valves, 70 m.p.h. maximum, any good proven engine, single seater, ceiling 15,000 to 20,000 feet.

This was certainly asking much in so few words. However, the Northrop Aircraft Company of Inglewood, Cal., set to work on the plans and delivered to Mr. Hawks the now famous Texaco "Sky-Chief." The date of delivery being around Christmas time and the unusual circumstances surrounding the project, has led many of Hawks' friends to refer to his ship as a Christmas present from Santa Claus . . . in the person, no doubt, of the Texas Company, Hawks' employers, who supplied the funds for this remarkable ship.

The reader will observe how closely the Northrop Company fulfilled the specifications Frank Hawks laid down. They did not quite make his cruising speed as it stands at 200 m.p.h., but they gave him an airplane capable of landing lightly loaded, at the amazingly low speed of 40 m.p.h., giving a speed range of approximately 5 to 1.

The Zap Flap, through which this result was obtained, is now familiar to everyone interested in aviation and Mr. Hawks has in the past year demonstrated the Sky Chief in many points all over the country.

He has made and broken speed records, but perhaps the thing which interests us most is his ability to set this exceptionally fast airplane down at the speed of a small training plane. The safety inherent in this low landing speed can readily be appreciated.

For one year, Frank Hawks rigorously tested his Sky Chief, putting it through gruelling grinds cross country, landing in small fields and large airports, carrying the gospel fast air transportation to all parts of the country. He has proven the practicability of several safety devices, among them the above mentioned Zap Flap and the automatic pilot, which takes over the controls and flies without fatigue.

Just recently, and approximately one year later than last Christmas, when he took delivery of his ship, its big brother, the Northrop Delta was being presented to the air transportation industry and it is now being flown on air lines here and in the countries south of us.

Its mettle has been tested and it has been found worthy to be a successor to the renowned Gamma of Frank Hawks' and to engage in the business of carrying passengers and mail.

The Delta flies at a top speed of 220 miles per hour, cruises at 195 and lands at 53.

Frank Hawks' work in speeding up air transportation and improving the safety characteristics is of incalculable value to the entire aviation industry.

Well, boys, here at last are drawings, accurate, authentic and detailed as fully as possible, of the famous Texaco "Sky Chief." Now you can build this remarkable plane. Most "detail scale" model builders look for a ship with beauty of design and abundance of detail to build a model from and the "Sky Chief" above all others has all of these. Plenty of work lies ahead so make up your mind that you're going to turn out a good model, or no model at all.

The Fuselage

The model can be made of any material, but let us assume that it is to be made of metal. You must first make a core or jig on which to line the bulkheads. This jig can be turned on your lathe from a solid piece of wood.

The stock from which the bulkheads are made is to be 3/32" square. The perspective drawing, page No. 19, shows the detail of bulkheads and metal covering, when sheet metal is used. When turning out the jig, you must make it 3/32" smaller in diameter than the outside of each bulkhead, for each bulkhead must slip over it at given points, as shown in side and top views of drawing, page 16. When all bulkheads are placed on the jig, turn to (page B), showing bulkheads. Solder a strip 3/32" wide by 1/32" thick to the bottom of each bulkhead from No. 2 to No. 8, on both sides.

Now solder the metal stiffeners which are "T" shaped as shown on page 19, to the outside of bulkheads form No. 1 to No. 16, ½" apart at the largest bulkheads and gradually coming closer together from No. 8 to No. 16.

Be sure that each stiffener is flush with the outside edge of each bulkhead before going any further. When this is done, build up the formers for the headrest fairing on to the fuselage bulkheads and place the metal skin over the semi-octagonal angles.

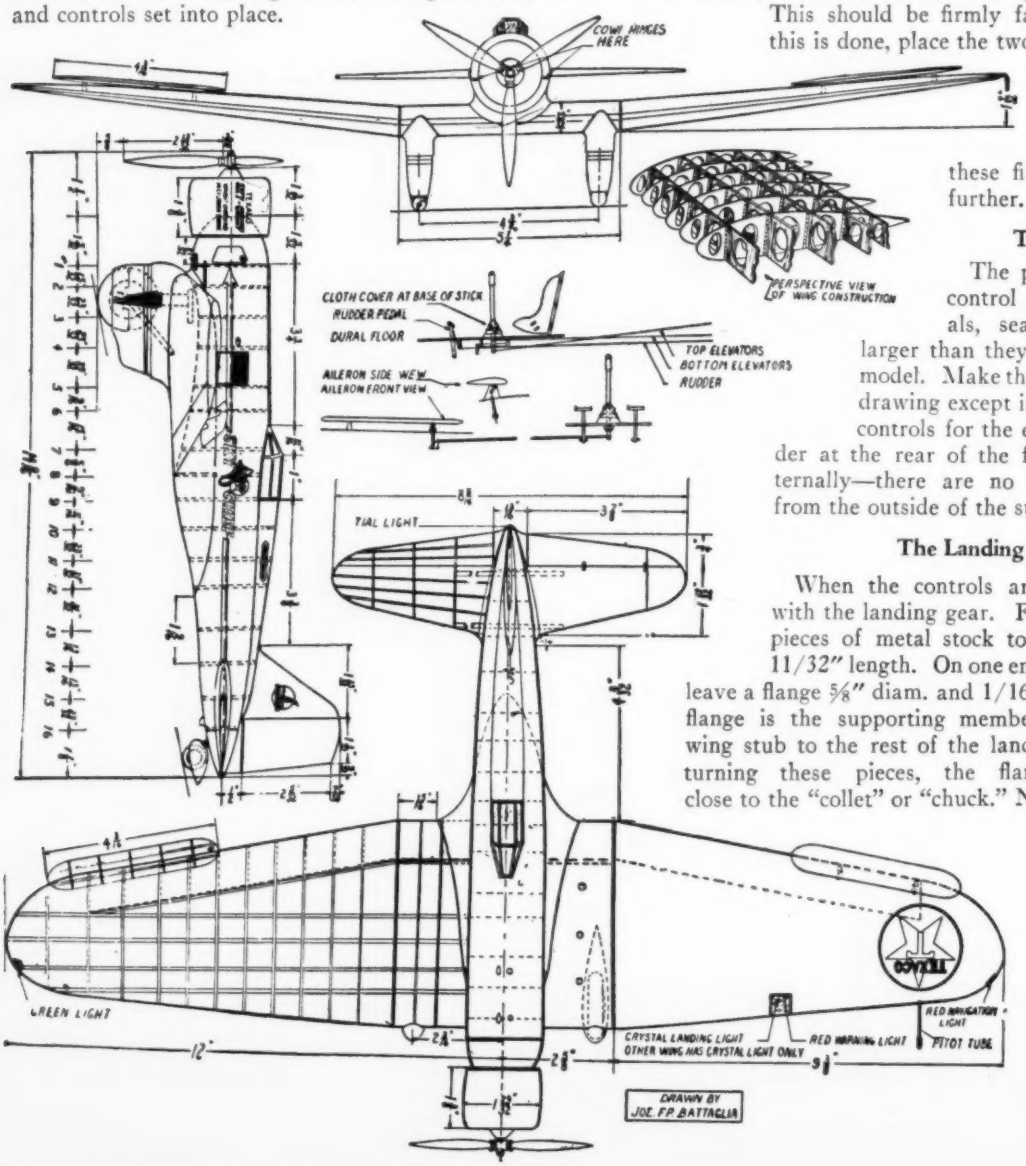
Do not cover the fuselage until the wing has been built and controls set into place.

The Wing

The spars are made of 3/32" thickness material. The size of each spar in the two outboard sections of the wing decreases from the root to the tip, but the spars in the center section vary only in width, corresponding with the sections of the ribs which accommodate them. Lay out the two leading edge spars first, then the next two, etc. When they are cut to size, lay out the lines for each rib station on them and drill large holes between every two ribs as shown in perspective view of the wing construction, on page 16.

Now make *one* template for *all* the ribs in the center section of the wing and a template for *each* rib in one of the outboard sections of the wing. Trace two ribs from each of the latter templates and all the center section ribs from the former template. Cut the slots in each rib as shown in the template on page 20, before drilling any holes in them. This acomplished, drill holes in ribs and fit them onto the spars, then solder them in place and you will have a very light but rigid wing.

Fasten the center section of the wing onto the fuselage. This should be firmly fastened in. When this is done, place the two outboard sections of the wing against the ends of the center sections and fit these firmly before going further.



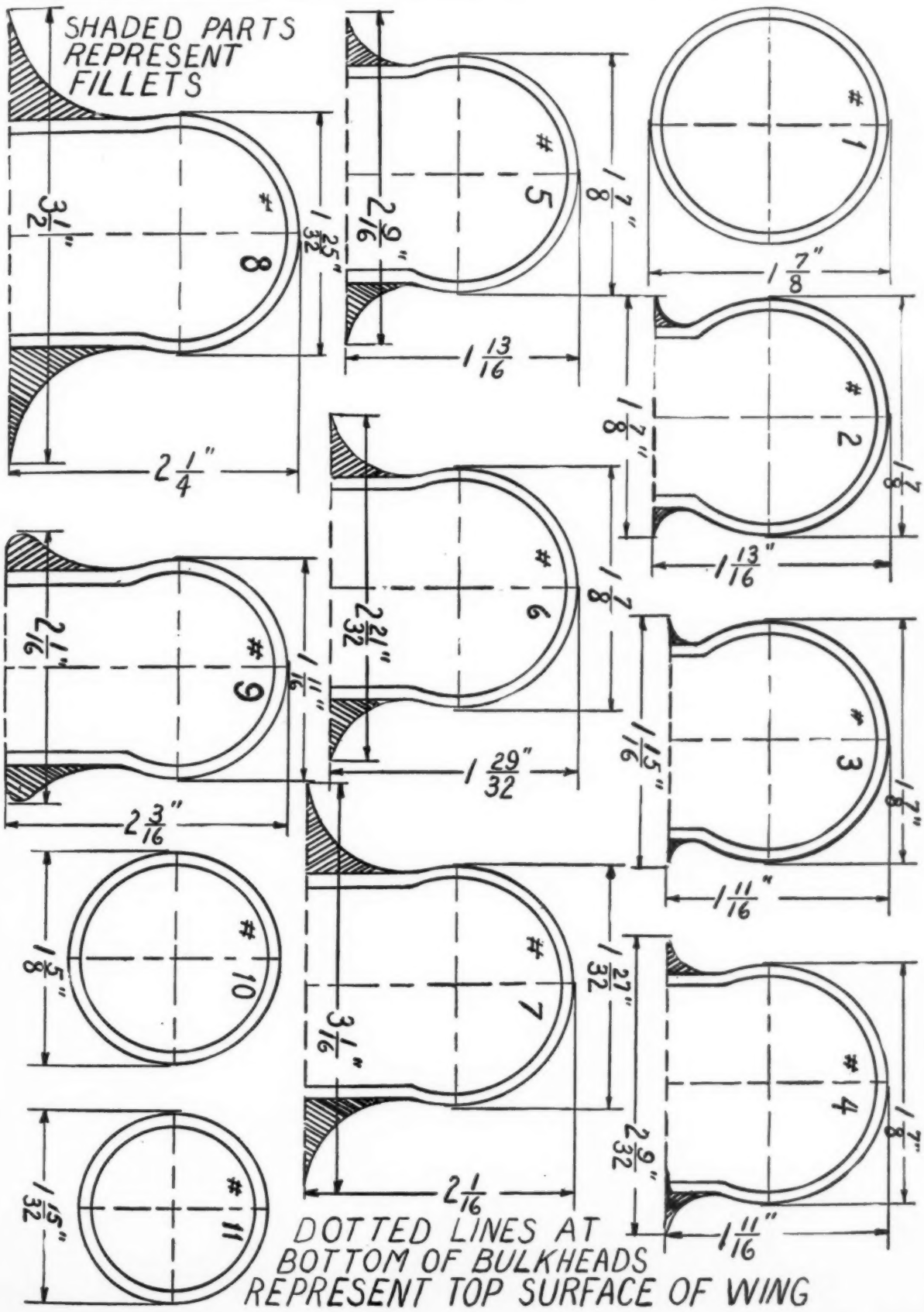
The Controls

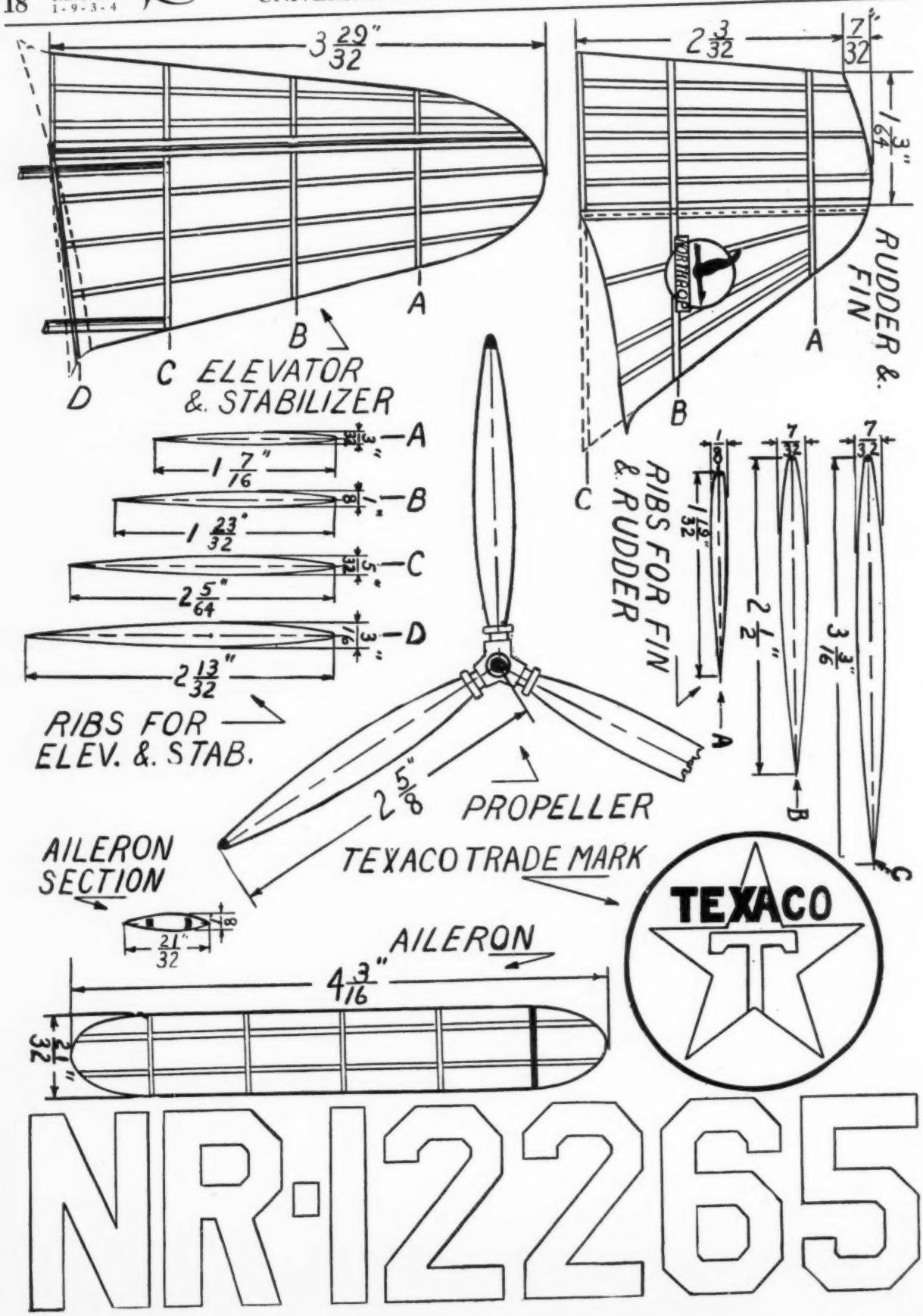
The perspectives of the control stick, rudder pedals, seat, etc., are 1/3 larger than they should be on the model. Make them as shown in the drawing except in dimensions. The controls for the elevators and rudder at the rear of the fuselage, work internally—there are no horns protruding from the outside of the surface.

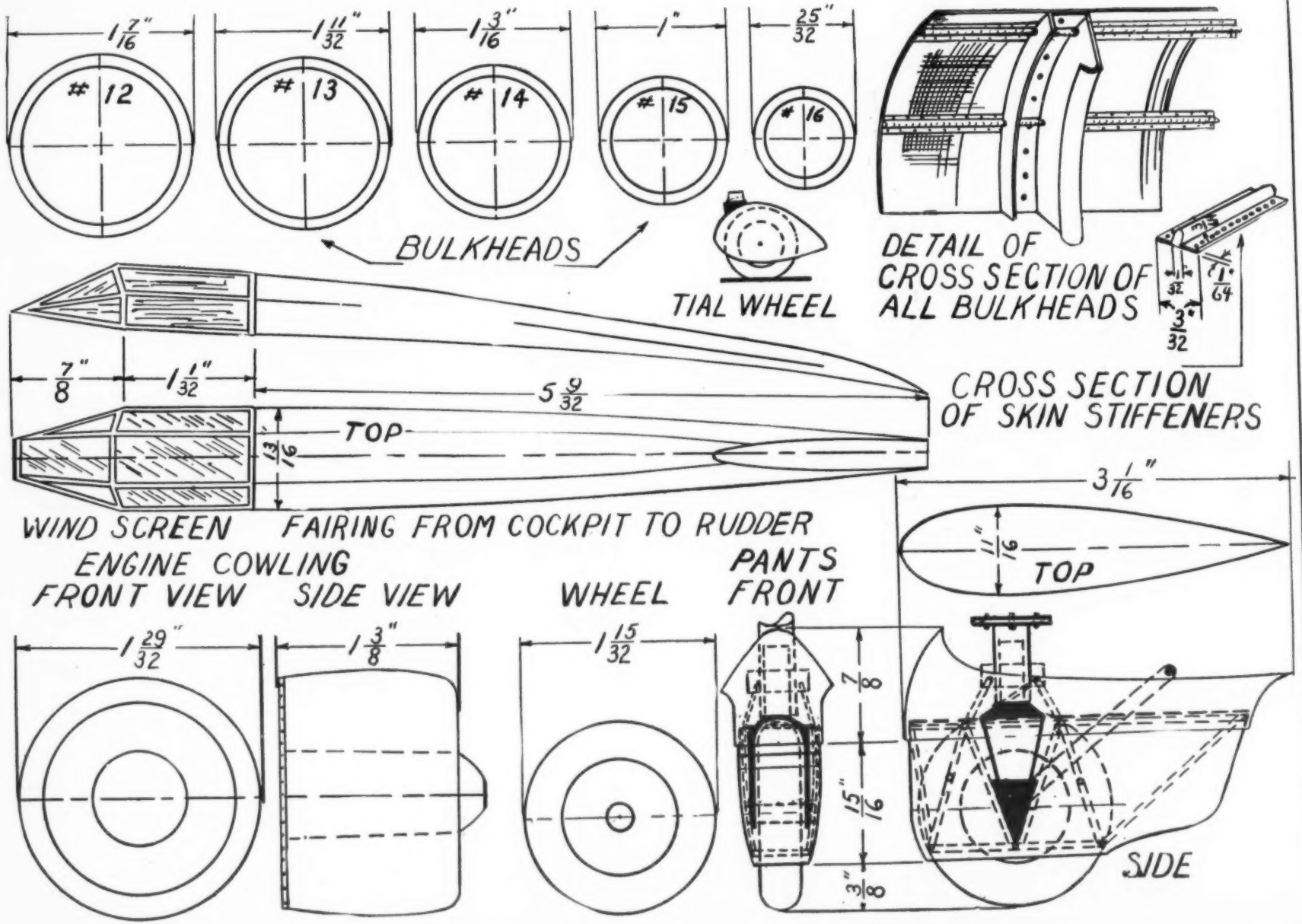
The Landing Gear

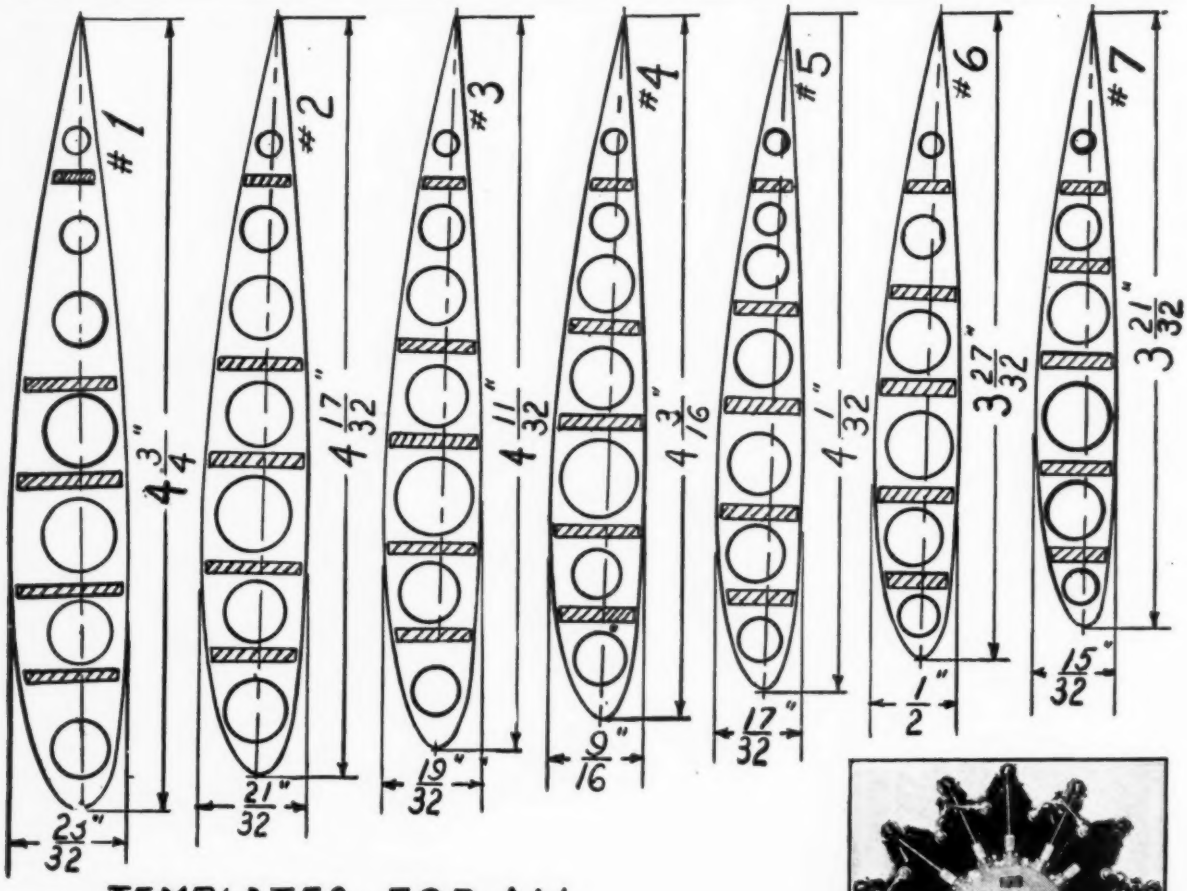
When the controls are finished, begin with the landing gear. First, turn out two pieces of metal stock to 9/32" diam. by 11/32" length. On one end of each of these, leave a flange 5/8" diam. and 1/16" thickness. This flange is the supporting member connecting the wing stub to the rest of the landing gear. When turning these pieces, the flanges should be close to the "collet" or "chuck." Now cut the opposite end of each piece farthest away from the flange to the length of 11/32" as prescribed and drill a hole 3/16" diam. into each one, but do not

(*Continued On Page 20*)

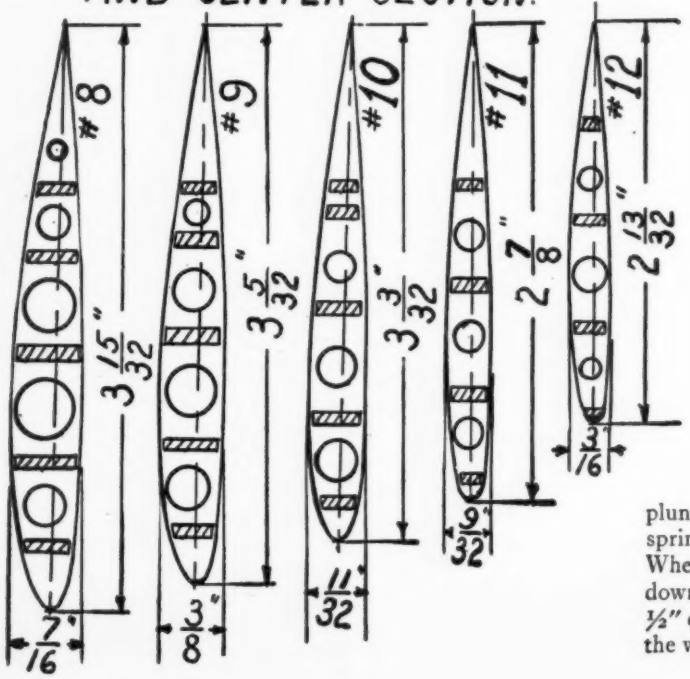

SHADED PARTS REPRESENT FILLETS
8
3 1/2"
1 25/32"
2 1/4"
5
2 9/16"
1 7/8"
1 13/16"
1
1 7/8"
2
1 7/8"
1 7/8"
1 13/16"
6
2 21/32"
1 7/8"
1 29/32"
9
2 1/16"
1 11/16"
2 3/16"
3
1 15/16"
1 7/8"
1 11/16"
10
1 5/8"
7
3 1/16"
1 27/32"
2 1/16"
4
2 9/32"
1 7/8"
1 11/16"
11
1 15/32"
DOTTED LINES AT BOTTOM OF BULKHEADS REPRESENT TOP SURFACE OF WING

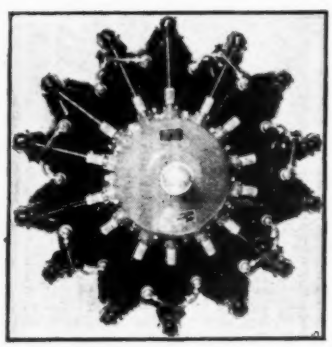

3 29/32"
A
B
C
D
ELEVATOR & STABILIZER
2 3/32
7/32
1 3/64"
RUDDER & FIN
A
B
C
RIBS FOR FIN & RUDDER
1 7/16" A
1 23/32" B
2 5/64" C
2 13/32" D
RIBS FOR ELEV. & STAB.
2 5/8"
PROPELLER
AILERON SECTION
21/32"
TEXACO TRADE MARK
TEXACO
AILERON
4 3/16"
21/32"
NR-12265


1 7/16"
#12
1 11/32"
#13
1 3/16"
#14
1"
#15
25/32"
#16
BULKHEADS
TIAL WHEEL
DETAIL OF CROSS SECTION OF ALL BULKHEADS
1/32
1/64
3/32
7/8"
1 1/32"
5 9/32
TOP
13/16
CROSS SECTION OF SKIN STIFFENERS
WIND SCREEN
FAIRING FROM COCKPIT TO RUDDER
3 1/16"
11/64
TOP
ENGINE COWLING
FRONT VIEW
SIDE VIEW
1 29/32"
1 3/8"
WHEEL
1 15/32
PANTS
FRONT
7/8
15/16"
3/8"
SIDE



TEMPLATES FOR ALL RIBS IN OUTBOARD WINGS AND CENTER SECTION.





(Continued from page 16)

drill through the flange ends. Solder these members in place just forward of spar No. 1 and between the first and second ribs from the side of the fuselage. Now cover the underside of the center "wing section," first drilling 5/8" holes for the flanges of the landing gear to fit through. This metal skin should be (.007) gauge sheeting. Now turn out the two forks which hold the wheels. The "plunger" which fits in the top member of the shock absorber should be 3/16" diam. while the fork end of the same must be ½" diam. and 13/16" long including the bevel, as shown on page 19 (front and side views).

Now drill ⅛" holes in the top ends of the 3/16" plungers within 1/32" of the fork ends. (⅛" diam. coil spring will fit in these holes to act as the absorbers). When the forks have been turned out and cut, file them down to ¼" at the bottom ends, leaving the upper ends ½" diam. Cut out the insides of the forks to accommodate the wheels and drill ⅛" holes through these bottom ends

(Continued on page 31)

Keeping Pace With Model Science

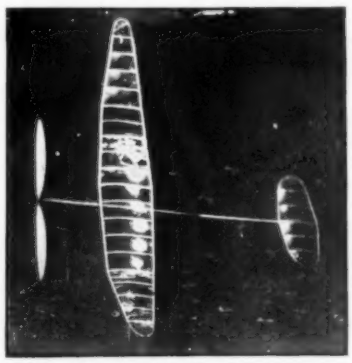
The Goldberg world's record baby R.O.G. time, 9 minutes, 34 seconds

Useful Facts Gleaned from the Experience of Foremost Indoor Model Builders in 1933

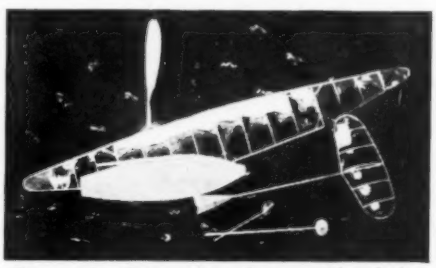
PART No. 11

By CARL GOLDBERG

MODEL airplane history has been written this year, 1933. In it, microfilm first came into widespread use. The indoor scientific duration tractor record passed the 1,000 second mark, with unofficial flights approaching twenty minutes. The Baby R.O.G. and Commercial types each have done approximately 10 minutes. Think of it! The R.O.G. has only 30 square inches of wing surface, yet it can fly longer than the world's indoor record of 1929. And that's not all! A number of builders are designing ships aiming at a top possible duration of thirty to forty minutes and they hope to achieve these marks by next summer. These feats are quite possible, in fact probable. With such deeds already accomplished and with such magnificent prospects ahead, none can deny what John Young, prominent New York builder, says: "Truly, model aviation is just beginning."



This endurance ship has flown 19 minutes, 34 seconds, unofficially



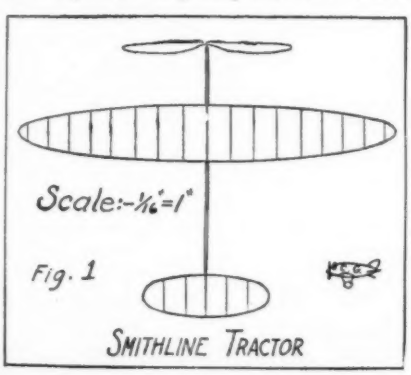
Parts units that go into the assembly of the Goldberg Commercial

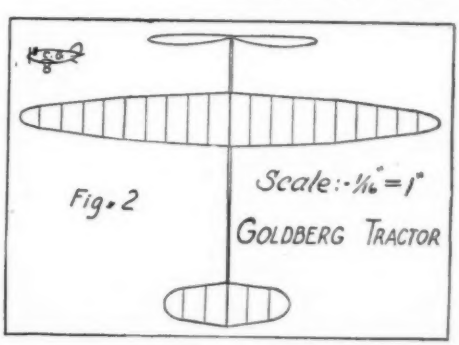
As in my last month's article, I shall attempt to present most of 1933's developments, this time for indoor model builders. First, let it be known that at least two models have actually flown more than nineteen minutes in a single, complete flight. One of these ships belonged to Laurence Smithline, of 301 W. 109th Street, New York City; the other was my own. Both flights were timed by Jerome Kittel, of 130 Winthrop Place, Englewood, New Jersey, and myself, using stopwatches. The National Contest winner, John A. Bartol, of 7 Codman Hill Street, Roxbury, Mass., made 17:47 and would probably have used his third flight to do even better, if this mark had been challenged. Unfortunately, I have little information on Bartol's ship.

Microfilm, the light wing covering developed through years of experiment, has had a great deal to do with our present advances, yet it is still in the experimental stage. The "perfect" film would need the following characteristics: toughness, lightness, dryness, flexibility. Thus far, tough, light films have been created with either dryness (lack of stickiness) or flexibility, but not both of these latter features together.

However, by the time this appears in print, the problem may be solved. A number of people are on the trail. The weight of good film is negligible—a strong film may weigh only 1/1000 of an ounce for 50 sq. inches, while a light risky film can be made that will weigh 1/1000 for 100 square inches. The method recommended for making and using it is as follows:

Fill the bathtub with water about 70 degrees, to a height of 10 inches. Pour half a teaspoonful of solution slowly and evenly onto the water's surface. Wait about two minutes; then, using a hoop which may be made from a wire clothes hanger, lift the film out by bringing the hoop up underneath at an angle so one side touches the film; gather the edges of the film on that side. Then drop the opposite side of the hoop until it is vertical. Slowly lift the hoop straight up and out and hang up to dry.





Build the wing in sections—preferably four sections two for the center, two for the ends. The film hoop should, of course, be big enough to cover the section desired. Next, coat the spars and ribs with whatever adhesive you use—I find water or saliva quite satisfactory, as they add no weight after evaporation,

although they take quite a while to dry out.

The section is next laid on the sheet of microfilm and pressed onto it so that it adheres well. See that all parts are sticking by turning the sheet over and inspecting. You may now use a hot wire (heated in a candle or other flame) to cut the section out of the sheet by running the hot wire around the outside of the section. Be very careful never to let the film come in contact with any metallic or other cool surface such as a table or bottle, as the film will stick and may tear. Better cover your working table with some heavy cloth. The sections may be glued together as soon as the water in the spars has evaporated, which will be best tested by weighing. Another method of lifting film off water is through the use of a piece of screen a little larger than the section to be covered and curved like an arc from end to end. The screen is placed under the film and lifted out horizontally, then heated above a candle flame so that the film balloons off the screen except near the ends. Covering is done as usual.

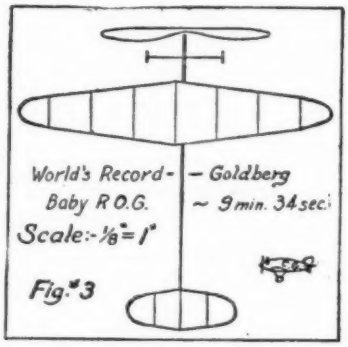
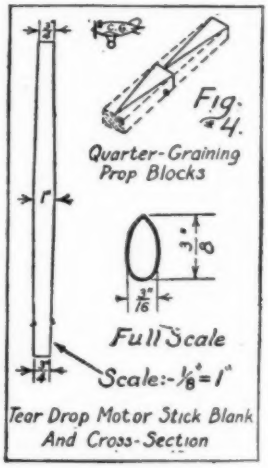


Fig. 3

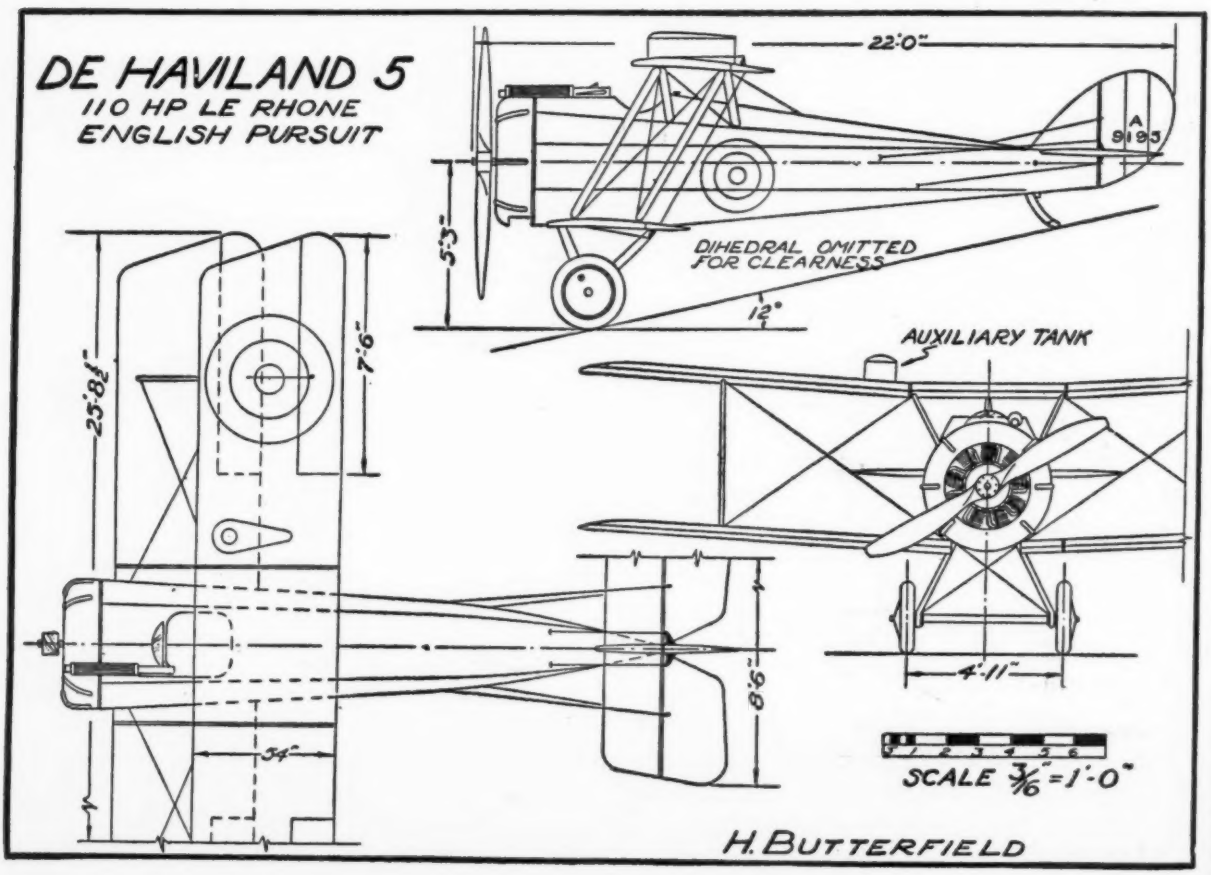


Wilbur Tyler of Boston, second place winner in the 1933 National Indoor meet, used what is known as a wing tip stabilizer. This is a small flat surface placed about five inches in from the end of the wing, and on a small boom extending across both the leading and trailing edges and out about four inches from the rear of the wing. One is employed for each wing half. The purpose is to increase the wing stability, and to prevent the wing from "washing-out" under full power or in a dive.

Bartol and Tyler also used a feature on their planes which has real advantages. It was first prominently used by Joseph Culver of Oakland, California, in winning meet at Detroit with a flight the 1929 National Indoor of 8:33. The feature consisted of a small cut-out in the center of the leading edge of the prop and amounts to moving the prop hub backward about ⅛ inch from the leading edge. By this means, it is possible to get the model to climb slowly at the start of the flight and so prevent the ship from getting too high and in danger from the building's rafters. The cut-out allows the leading edge of the prop to bend forward when under full power, thus making the prop higher pitched and slowing it down by means of the greater blade angles.

Speaking of props, a mild sensation was caused by the

(Continued on page 32)



The Aerodynamic Design of the Model Plane

A Little Known Cause of Rolling and Fundamental Principles Underlying Directional Stability

By CHARLES HAMPSON GRANT

ARTICLE NO. 23 CHAPTER NO. 3

LAST month it was shown that the righting tendency was increased if the wing was raised so that the center of gravity was lower relative to the wing or center of lift. However, it is desirable to have as little dihedral angle in the wing as possible, for the less dihedral the greater the lift generated by the wing. Therefore, when the center of gravity is lowered, the dihedral may be *decreased* without a loss of stabilizing or righting moment. It is merely a matter of increasing stability due to a low center of gravity and reducing stability an equivalent amount due to a *decrease* in the dihedral angle.

The parasol monoplane has become quite popular, especially in indoor models, because of this principle. By raising the wing so that it is about one-twentieth the span above the line of thrust, the dihedral may be reduced to about half the ordinary amount of one inch rise of each wing tip for every foot of span. However, this is a minimum amount. Larger dihedral may be used with greater stabilizing effect, if desired.

Harmonic Oscillation

In preceding pages of this treatise on design, a difficulty which arises from a dihedral angle and a low center of gravity, was discussed. These two factors must be in the proper relationship to one another or "rocking" or rolling oscillations will result. Let us take an example and follow the action of the plane step by step.

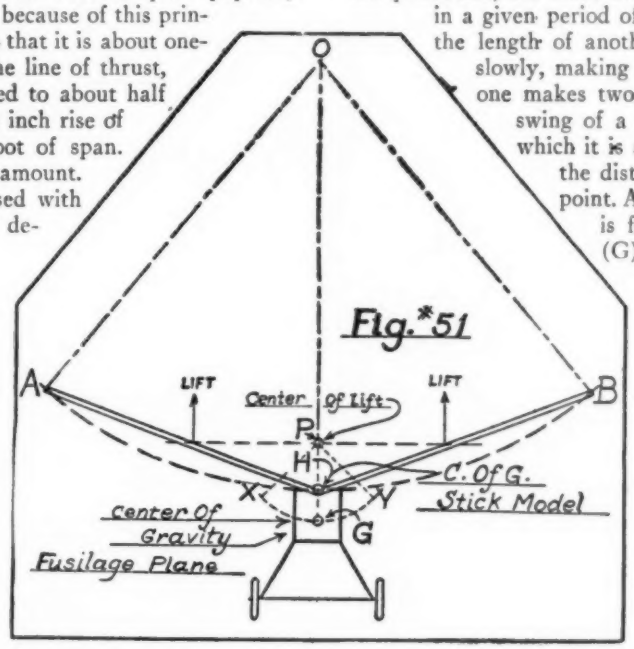


Fig. *51

Suppose our plane has a dihedral in the wings as shown in fig. No. 51 and a center of gravity that is located at point (G). The center of lift is point (P). Actually the weight of the plane is suspended at point (P). If the wing (A) is suddenly pushed upward by a wind gust, the center of gravity at point (G) will move along the arc (XY) towards point (X). The reaction from this displacement will cause the plane to rock back again, the point (G) swinging back along arc (XY) about point (P) like a pendulum. The rocking motion will not be such that (C. of G.) will come back to point (G) and stop there. It will tend to keep on swinging up towards point (Y). In other words, the C. of G. will swing from one side to the other like a pendulum about point (P).

Under this influence the plane will rock sideways back and forth until the action is dampened out by the wings acting on the air. This tendency to rock, due to the low C. of G. alone may not be very pronounced. However, the wings when set at a dihedral angle as (AHB), also give a rocking tendency to the plane. The motion of the ship due to the dihedral will tend to follow the arc (AHB), swinging about the point (O). Thus we have two rocking tendencies acting in the same ship, about two different fixed points. Each one of these separately tend to roll the ship, but what is the result when they act together? Whether it makes for stability or causes greater rocking effect depends entirely upon the length of the radii of swing, or length of the "pendulums" *relative* to one another. The radius of swing of the (C. of G.) is (PG), while the radius of swing due to the dihedral is (OG).

We know one fact from our study of physics and that is that the period of swing or the number of swings a pendulum will make depends upon its length. The shorter the pendulum, the more swings or oscillations it makes in a given period of time. A pendulum of twice the length of another one will swing twice as slowly, making one swing while the shorter one makes two. The law is: the period of swing of a weight about a point from which it is suspended is proportional to the distance of the weight from the point. According to this law, if (OG) is five times as long as (PG), (G) will have a tendency to swing about point (P) five times while (G) tends to swing about point (O) once, due to the dihedral action. We can see then that at every fifth swing of (G) about (P), the tendencies to swing due to the dihedral and to the (C. of G.) will both be exerted in the same direction. Their disturbing effect at this instant will be *combined* and will cause the rocking of the ship to become more violent. In fact this pulse or beat due to the combined tendencies will occur at regular intervals and increase the rocking to such an extent that the plane will roll over completely. This has occurred many times in actual flights of models.

If the length of the long pendulum (OG) is an even multiple of the shorter one (PG), for instance six times

(Continued on page 38)

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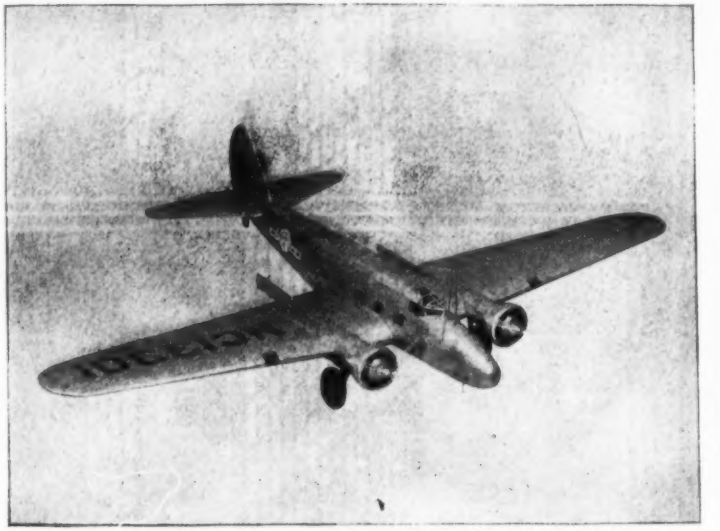

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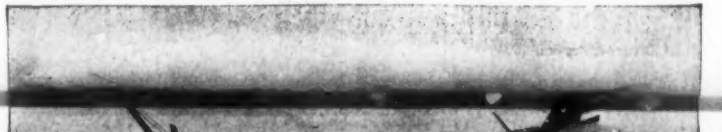

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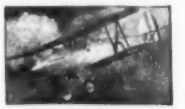

1932 HAWKER FURY
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1918 FOKKER D-8
Span 20⅜", length 24½", weight 2.9 oz. Blue and cream, black details. Kit SF-34, only **$2.00.**

1932 AERONCA C-3
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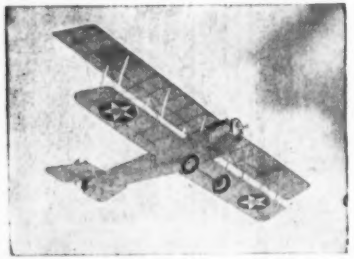

1916 CURTISS JN4-D

This authentic model of America's beloved "Jenny," in which many of our war pilots learned to fly, is quite simple to build, very nicely detailed, with dummy motors, its "mess of wires," and all. Graceful flyer. Span 32⅜", length 20⅜", weight 2.7 oz. Entirely yellow, details black. Complete Kit No. SF-4, at dealers, or postfree, only **$3.00.**

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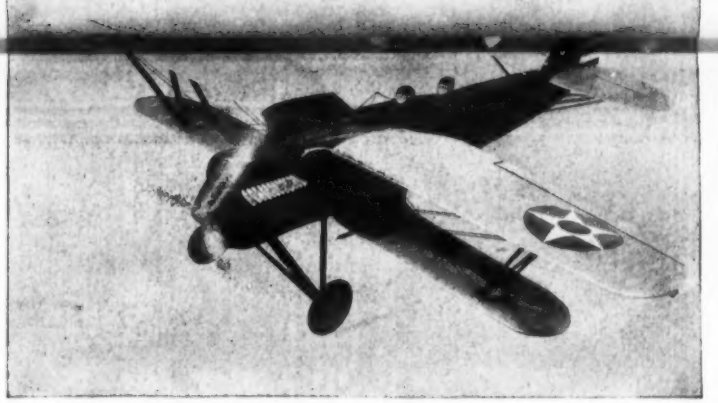

1933 BERLINER-JOYCE P-16

This very interesting model, the prototype of which is hailed as the first successful American two-seater pursuit design, was planned and designed after repeated requests by many model enthusiasts, both men and boys alike. You'll find it extremely fascinating to build and when ready, to put on some real flights. Span 25½", length 21", weight 3.9 oz. Colored the standard army yellow wings and tail surfaces, balance olive drab, with black details. Kit comes complete with all printed out wood and parts, and completely detailed full size authentic C-D drawing, together with everything needed. Complete SF-39 at dealer's or postfree, only..... **$3.00**

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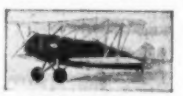

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1931 BAYLE'S GEE-BEE (Re-Designed)

Everybody's talking about this model. Don't miss getting it for your line-up of Thompson Trophy winners. Yellow and black. Span 17½", length 12", weight 2 oz. Complete Kit SF-17B (with printed out balsa) at dealers, or postfree, **$1.75.**

1931 CURTISS HELLDIVER
Span 23⅝", length 16½", weight 2.7 oz. Blue and silver. Kit SF-7 (while they last) **$1.75.** (Originally 3.50.

1931 POLISH P-6 FIGHTER
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1930 HOWARD RACER (Re-Designed)

Beginners will find it simple to build—experts will glory in its detail and realism. All white, black details. Span 15", length 15¼", weight 1.5 oz. Complete Kit SF-18B (with printed out balsa) at dealers, or postfree **$1.50.**

1932 LINCOLN SPORTPLANE
Lightplane enthusiasts' delight. Span 15", length 12⅛" weight 1 oz. Cream and black. Kit SF-36, only **$1.50.**

Eastern States Indoor Model Airplane Contest

Sponsored by Universal Model Airplane News

JOY will break out in the ranks of the indoor model builders upon learning that the annual indoor contest will be held on Thursday, December 28th, at the 165th Regiment Armory, Lexington Avenue, at 26th Street, New York City. Last year this contest proved to be a great success and its sponsors will endeavor to make the 1933 contest even greater. A large part of the success will be due to the performance of the models entered and the co-operation of the contestants. Let's "get going" and put over a good show.

Following are the rules governing the contest.

Official Rules for the Eastern States Indoor Model Airplane Contest, Sponsored by Universal Model Airplane News and sanctioned by the National Aeronatic Association.

All contestants must be under 21 years of age. There will be no senior and junior classes.

Each contestant shall be the owner, builder and operator of the competing models. However, the design may be obtained from any source. All parts except thrust washers must be built by the contestant.

No part of a model may be dropped in flight. Models must be powered with rubber strands.

Each contestant will be allowed, in each contest, three official flights. He will be credited with the greatest elapsed time made in any one of his three flights. A contestant is allowed a total of three models in each contest.

A flight is a start which lasts for 30 seconds or longer. Any flight under that or failure to fly in turn promptly when summoned, is a delayed flight. Three successive delayed flights will be considered as an official flight.

Any contestant breaking the contest rules or conducting himself contrary to the ordinary requirements of common courtesy, may be disqualified. Models are not disqualified if broken in landing after an official flight.

Flight time begins the instant a model is in full flight, and ends when the model first touches the floor or meets any object preventing further flight within ten seconds. However, if a model meets an obstruction and falls free independently and resumes flight within ten seconds, time shall not be interrupted.

Rise off the Ground (R.O.G.). A model is of the R.O.G. type when it has a landing gear that permits it to take off the ground or floor under its own power, starting from rest. The landing gear must be strong enough to support the model while taking off or landing. The contestant must demonstrate its usefulness by gliding the model to the floor from a height of not less than four feet. The model must land without damage to itself or landing gear and without nosing over during this demonstration. The wheels must turn freely.

A model is hand-launched when it is released for flight directly into the air from the hands of the launcher. It must be launched from a height above the floor of not more than six feet.

There will be three contests in this meet; namely, Baby R.O.G., Commercial Fuselage and Endurance Contest.

Baby R. O. G. Contest

No restrictions on the design of the model except that it must have main supporting surfaces (wings) of not more than 30 square inches in effective area. The diameter of the wheels must be not less than ½ inch. Model must be R.O.G. type and so launched.

Commercial Fuselage Contest

Model must have built-up fuselage which is covered over at least 90 per cent of its surface. The fuselage must have a maximum cross section area at least equal to one-tenth of the *model's length*, squared.

Length in this case is the $\left(\frac{L}{10}\right)^2$ over-all length of the model not including the propeller. Model must have main supporting surfaces (wings) not over 150 square inches in effective area. Model must be R.O.G. type and so launched. The wheels must be not less than one inch diameter.

Endurance Contest

No restriction on the design of the model except that it shall have main supporting surfaces (wings) of not over 150 square inches in effective area. Model must be hand-launched.

Examples of Fuselage Formulas

$$\text{Required cross section area} = \left(\frac{\text{length}}{10}\right)^2$$

If over-all length of model is 20 inches,

$$\text{required area} = \left(\frac{20}{10}\right)^2 = 4 \text{ square inches.}$$

If over-all length of model is 25 inches,

$$\text{required area} = \left(\frac{25}{10}\right)^2 = 6.25 \text{ square inches.}$$

At least one part of the fuselage must have a cross section equal to the required area.

This meet will be held Thursday, December 28th, 1933, at the 165th Regiment Armory, Lexington Avenue, at 26th Street, New York City.

Entrants upon arrival at Armory shall immediately report to RECORDER for official inspection and approval of their models and to receive official tournament numbers. No entrant will be permitted to compete in any event without having properly registered his model(s) and name with the RECORDER.

As the contests are being held under N.A.A. rules, the possible record-breaking results will be certified to this organization.

There will be no cash prizes but there will be cups, trophies and medals, all worth while.

This is an Eastern States Meet but it is

(Continued on page 46)

"SKYCRAFT"

By Augustus Post

(New Edition) ***Oxford Press $1.50***

Review By Edwin T. Hamilton

In 1914 Augustus Post wrote, "The man is now living who will be the first human being to cross the Atlantic Ocean through the air . . ." He then proceeded to describe the flight of Charles Lindbergh to the smallest detail.

None of us can afford to miss reading in 1933 anything written by a man who knows the pulse of aviation well enough to make such a prophecy in 1914. Pioneer balloonist, early aviator, incorporator and charter member of the Aero Club of America, maker of the rules governing the New York-Paris flight won by Charles Lindbergh, President of the American Soaring Association, editor, magazine writer, author, Mr. Post brings a wealth of experience to his readers.

But he brings more than experience. He brings an inherent ability to write, and it has been the sad experience of your reviewer to read many "experts" who should never have placed their exploits in print.

With a foreword by Glenn H. Curtiss and an explanatory introduction by the author, we are plunged into the romance of aviation by one who has lived it. Chapters on aircraft types, the principles behind flight and stability, airplane control, engineering, and instruments, carry us in everyday language into one of the finest chapters on "How to Fly" that I have ever read. If you can read that and stay on the ground, see a doctor.

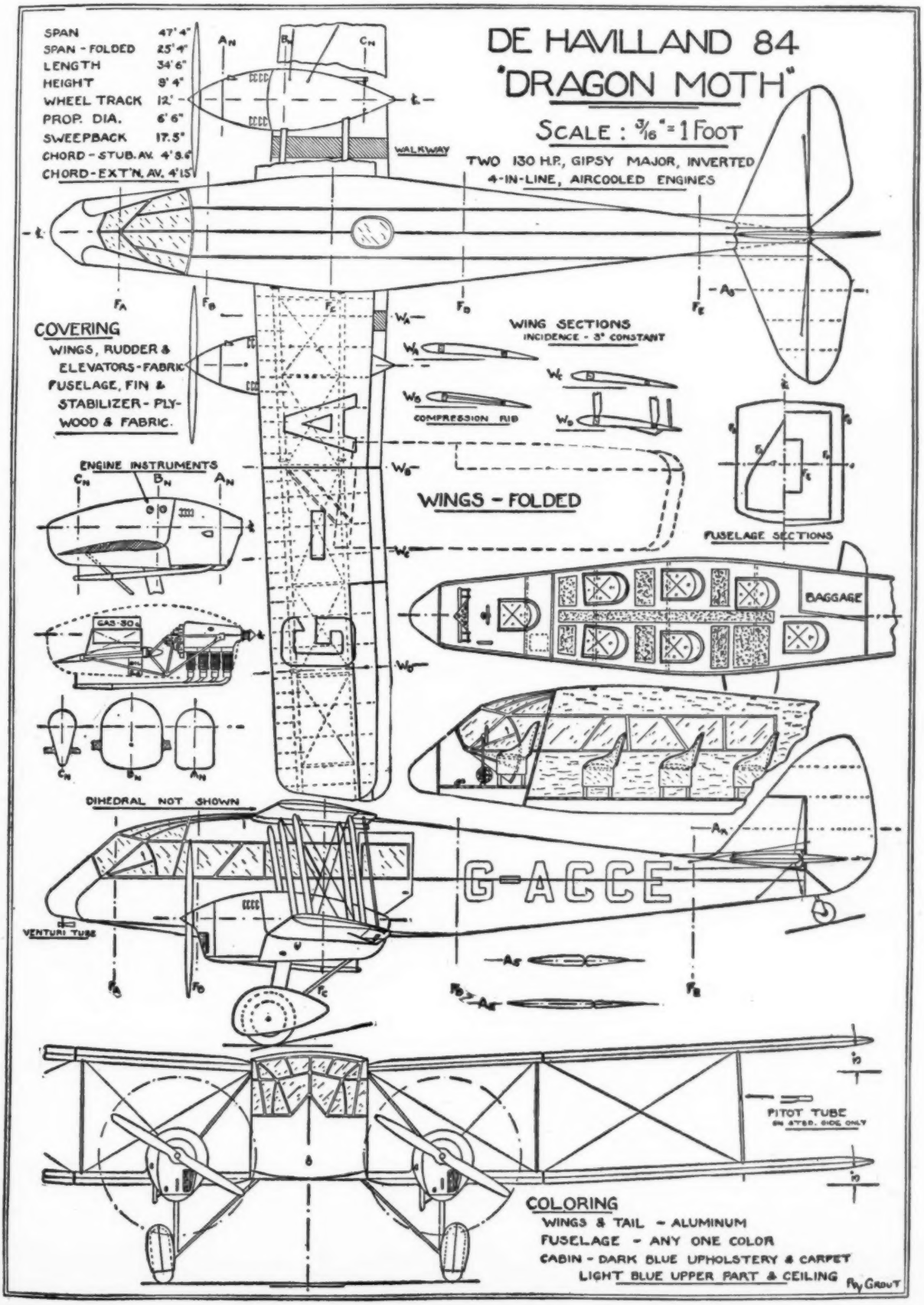
Mr. Post's chapters on parachutes, gliders, balloons, dirigibles, and the effect of weather on them all should give any reader a wealth of aeronautical knowledge second to none. In "A Glimpse of the Future," the author, true to his reputation, prophesies the future of aviation. The chances are that it will prove as close a picture of the future as you will ever see.

I do not agree with the publishers that this is a boys' book. In my opinion it belongs to the boys, girls, mothers and fathers of America. In fact, anyone who has the slightest interest in world events in general and aviation in particular should read it, whether that interest lies in actual participation or merely a normal desire to keep abreast with the times.

The book was first published in 1930 at $3.00. The new edition has been brought up to date with added photographs and contains the latest developments. With ninety-six fascinating photographs and ninety-eight clear, concise, and instructive diagrams, it is a book one should be proud to have in his library. A glossary of terms completes the work.

This reviewer makes a plea to the publishers for another by the same author on his personal reminiscences alone, as Mr. Post's footnotes of his own experiences appear far too seldom.

All such books are "old stuff" to aviators, so possibly the greatest tribute one with fifteen years of flying behind him, such as your reviewer, could give the book is to say that I started reading it at nine one night and didn't put it down until four the next morning.


DE HAVILLAND 84
"DRAGON MOTH"
SCALE : 3/16" = 1 FOOT
TWO 130 H.P. GIPSY MAJOR, INVERTED 4-IN-LINE, AIRCOOLED ENGINES
SPAN 47'4"
SPAN - FOLDED 25'4"
LENGTH 34'6"
HEIGHT 8'4"
WHEEL TRACK 12'-
PROP. DIA. 6'6"
SWEEPBACK 17.5°
CHORD - STUB. AV. 4'8.6"
CHORD - EXT'N. AV. 4'15"
WALKWAY
COVERING
WINGS, RUDDER & ELEVATORS - FABRIC
FUSELAGE, FIN & STABILIZER - PLYWOOD & FABRIC.
WING SECTIONS
INCIDENCE - 3° CONSTANT
COMPRESSION RIB
WINGS - FOLDED
FUSELAGE SECTIONS
ENGINE INSTRUMENTS
BAGGAGE
GAS-30
DIHEDRAL NOT SHOWN
G-ACCE
VENTURI TUBE
PITOT TUBE
ON STBD. SIDE ONLY
COLORING
WINGS & TAIL - ALUMINUM
FUSELAGE - ANY ONE COLOR
CABIN - DARK BLUE UPHOLSTERY & CARPET
LIGHT BLUE UPPER PART & CEILING
Roy Grout

THE NATIONAL AERONAUTIC ASSOCIATION JUNIOR MEMBERSHIP NEWS

Special Rates for Model Plane Builders and Flyers as Junior Members in the N.A.A.

MODEL enthusiasts may now join the National Aeronautic Association at greatly reduced rates. Annual dues are twenty-five cents with an initiation fee of twenty-five cents additional. There are no other expenses. The junior membership pin is a silver replica of the gold pin worn by adult members. This pin shows that the wearer is working side by side with the foremost leaders in aviation to keep America "first in the air." Members also receive a membership card which serves as identification.

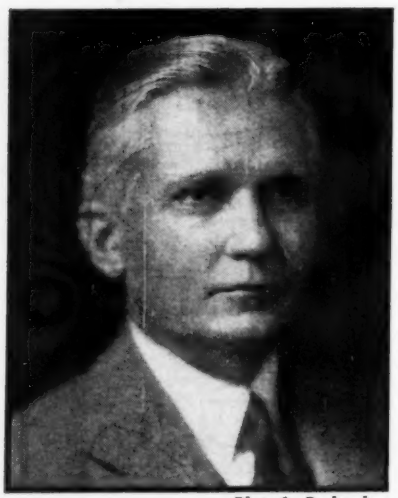


Photo by Bachrach

The Association's President, Hiram Bingham, has been an F. A. I. pilot since 1917

Every month in these pages the Association will publish for the benefit of the junior members many items of keen interest to model builders and flyers. There will be club news, lists of records, copies of the N.A.A. rules for model plane contests, plans of the outstanding models that are making record flights, announcements of contests and countless other items that model builders want to know.

Membership in the Association entitles you to the privilege of competing for N.A.A. trophies and having your record making flights recognized officially. Members will receive certificates for record flights. These are beautifully engraved and may be framed for exhibition with your trophies.

Just read on the next page the names of the Association's officers, Advisory Board and Governors-at-large. It is surely an honor to be associated with such high ranking aviation leaders as these. They are all greatly interested in model planes too, as well as the large airplanes used by commerce and by the military forces.

Why I Believe in the N.A.A.

By Hiram Bingham, President

PEOPLE frequently ask me why I am willing to devote my time and attention to the National Aeronautic Association. Some people think it is because there is money in it, and are surprised to find that the officers of the Association all serve without pay and that every president of the N.A.A. since its incorporation eleven years ago has made liberal contributions to its budget, in accordance with his means.

I work for the N.A.A. because I believe in it and in the objects for which it was established. I know of no organization which offers such a wide field of usefulness to those who want to work for the advancement of American aviation.

The purposes for which the N. A. A. was formed are set forth in Article II of the Articles of Incorporation. They are too long to be quoted here at length, but I know of no better way to tell you why I believe in the N. A. A. than to quote cogent sentences from our charter. We were incorporated in order to "foster, encourage and advance the science of aeronautics . . . to encourage and promote the study and advancement of the science of aerial navigation . . . to kindle and keep alive a general interest in the art of flying . . . to advise and encourage those engaged in the trade and business of manufacturing and operating any and all types of aircraft . . . to gather, compile and disseminate general and scientific data of every kind having to do with the science of navigation or any of the allied and kindred sciences, and to edit and publish the same in the form of bulletins, pamphlets, magazines and books . . . to aid and encourage the establishment and maintenance of a uniform and stable system of laws relating to the science of aeronautics and the art of aerial navigation and all allied and kindred sciences and arts . . . to collect, edit and disseminate general and scientific knowledge of flying fields and flying routes . . . to foster progress in the science of manufacturing and operating all kinds of aircraft . . . to encourage inventions and improvements having to do with aerial navigation . . . to encourage, promote, arrange for, and carry on aerial exhibitions, exhibits and contests . . . to sanction contests and formulate the granting of awards, prizes, and distinctions . . . to cooperate with the Executive Departments, commissions, and other agencies of State or Federal government in their investigation of, and legislation pertaining to aviation."

Is not that an attractive program? Who wouldn't believe in it? Surely those who drafted the Articles of Incorporation had far-sighted vision and great enthusiasm for the possibilities facing the new Association.

Annual National Championship Model Plane Meet

EACH year in the early summer the Association plans to hold the National Championship Model Plane Meet. There are seven traditional trophies for this meet, Mulvihill Trophy, Stout Indoor Trophy, Rear Admiral William A. Moffett Memorial Trophy, Bloomingdale Cup,

Commander Frank Hawks With Texaco Trophy

Universal Model Airplane News Trophy, Stout Outdoor Trophy, and Texaco Trophy. These trophies will be pictured in these pages from time to time. This issue shows Commander Frank Hawks with the Texaco Trophy.

It is hoped that next month the plans for the 1934 National Championship Meet will have progressed sufficiently to be ready for announcement. It is planned to hold a meet that will be better and bigger than ever.

THE NATIONAL AERONAUTIC ASSOCIATION

Headquarters: Dupont Circle, Washington, D. C.

HIRAM BINGHAM, President

F. TRUBEE DAVISON, Vice-President — R. F. GARLAND, Secretary

JOHN F. VICTORY, Treasurer — PORTER ADAMS, Chairman Executive Committee

U. S. Representative F.A.I.

THE National Aeronautic Association has for its purpose the advancement of aeronautics throughout the United States.

AS the representative in the United States of the Federation Aeronautique Internationale, the sport governing body of the world for aeronautics, the Association has as a special responsibility the encouragement and regulation of aeronautic competition. Each year the National Air Races are conducted under the supervision of the Association's Contest Committee and sanction of the Association. Similarly, model plane contests are sanctioned by the Association and conducted under the supervision of officially appointed Contest Directors.

ANY person interested in aeronautic Advancement may apply for membership in the Association. Junior membership dues for all those under twenty-one years of age are twenty-five cents annually with initiation fee twenty-five cents additional. National regular membership for adults costs $5.00 annually. Junior membership dues include subscription to news bulletins and other items of interest which are mailed regularly to members every three months. National regular membership dues include subscription to THE NATIONAL AERONAUTIC Magazine. Members of chapters pay only the dues of their chapter.

THE Association offers the most efficient means by which individuals and aeronautical clubs and societies may unite to promote the growth of aeronautical knowledge and to increase public appreciation of what we owe to aviation and what may be expected of it in the future. The effort of many individuals and organizations, united in such a comprehensive association for the advancement of aeronautics, is capable of exerting a most beneficial influence in national and international development.

A member of the Association has the satisfaction of knowing that he is working side by side with the foremost leaders in aeronautics, who constitute its officers, advisory board, board of Governors and committees. They give their time willingly and without compensation, solely to see that America does not lag behind in the art and science which was born in this country.

THE National Aeronautic Association is a patriotic organization operating without financial profit to further the advancement of aeronautics in all its branches. Its income is derived from membership fees, sanction fees and licensing of pilots. It is not endowed and receives no fixed income or grant from the Government nor from the aircraft industry.

THE usefulness of the Association in spreading a knowledge of aeronautics is dependent upon the number of its members. It relies upon its present members to provide new members. The requirements for membership in the Association are that the applicant be a firm believer in the art and science of aeronautics and of its adaptability as a vital asset to the economic life and defense of the nation, and be agreeable to abide by the By-laws of the Association.

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NATIONAL AERONAUTIC ASSOCIATION OF U. S. A.
DUPONT CIRCLE
WASHINGTON, D. C.

I hereby make application for membership in the National Aeronautic Association as a Junior Member.

I enclose fifty cents for initiation fee and first annual dues. (Use check or money order.)

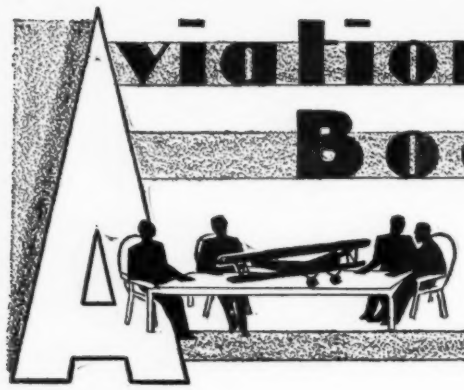
Name .....
(Please print or type)

Street .....

City ..... State .....

Date of Birth .....
(Month, Day, Year)

Approved .....
(Parent sign here, if applicant is under eighteen)



Aviation Advisory Board

Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U. S. Army

IT IS with pleasure that we notice that our model fans are devoting themselves to aerodynamic progress. It is evidence of serious thought.

Here are a few questions of this nature submitted by A. Kaufman, of 4654 St. Louis Ave., Chicago, Ill.

Question: What is the proper ratio of maximum width to length in a streamline body?

Answer: The length should be three times the width or more. Any streamline body whose length is less than this amount is inefficient. The smaller it is the more inefficient it is. If its length is more than ten times its width, the skin friction induced amounts to such a large quantity that the efficiency drops. In other words, make your streamline body so that the length is 3 to 10 times the width.

Question: At what distance from the leading edge should the maximum width of a streamline body occur? Does this vary with different speeds?

Answer: The maximum width of a streamline cross section should occur at a point 1/3 of its length from the front edge. This does not vary with different speeds an appreciable amount. At high speed it is possible that the widest portion should move slightly forward to a point 25% from the front edge.

Question: What are the factors that enter into the design of a propeller for a flying model dirigible?

Answer: The factors are the same in this case as in the case of an airplane. These factors merely change in value. Usually the model dirigible propeller should be of low pitch as the speed of the dirigible is much less than that of an airplane.

I suggest that you read the articles on the "Aerodynamic Design of the Model Plane" which appeared in the June to October 1932 issues of "Universal Model Airplane News."

Question: How do sweptback wings improve stability?

Answer: This question is answered thoroughly in our December issue in the article "Aerodynamic Design of the Model Plane."

Question: When the center of gravity is back of the wing how can a low center of gravity be obtained in order to give the plane stability, without adding a lot of weight to the model?

Answer: One or a combination of the following ways may be applied. Make the rubber motor long, extending back to the rear point of the fuselage; move the wing forward toward the nose; make the tail surface heavy and strong.

Probably the best method of accomplishing this end is to raise the wing above the fuselage, making the model into a parasol type.

We hope this information will give you some assistance.

HERE are some questions from Reginald Saunders, of 3038 Douglas St., Victoria, B. C. Saunders asked these questions sometime ago and we regret that we have been so late in answering them. However, we might say, "Better late than never."

Question: I have just completed a 28" monoplane of my own design which will fly along for about 75 to 100 feet and then suddenly stall. What is wrong?

Answer: In the normal model flight the plane is traveling fast at the beginning of the flight. The speed diminishes progressively from the start to the finish. At the end of the flight the ship goes into a glide. It is evident that Saunders' ship stalls when it starts to glide. In other words, that under power provided by the propeller the nose is held down into flying position. When gliding the nose is pulled up and the ship stalls.

In this case the ship should be built so that the glide is gradual. Then, in order to insure the proper climb for the ship, give the stabilizer surface a greater negative angle. Lower the front edge slightly, perhaps 1/16 to 1/8". We think that this will correct your trouble.

Question: What size propeller block do I need for a racing plane with 54" wing area?

Answer: As this is a racing plane the pitch of the propeller should be approximately 1¼ times the diameter. The area of the propeller of an average model should be about 10% of the wing area. However, with a speed model which you wish to get under way quickly, it is advisable to increase the area of the propeller blades slightly. We advise that the blades should be 15% of the wing area. The size of the block for such a ship should be approximately 7" long, ¾" deep and ⅞" wide.

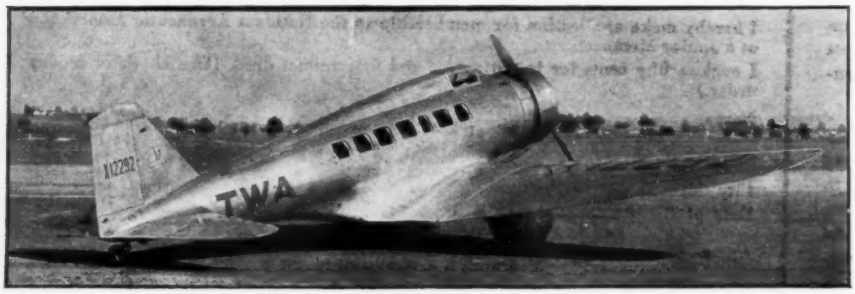
Fred H. Parish, of 165 Smithfield Ave., West Kildanan, Wpg., Man., asks the following questions:

Question: What is air speed?

Answer: Air speed is the speed of the airplane, relative to the air through which it is passing.

Question: What is ground speed?

Answer: Ground speed is the speed of the airplane relative to the ground. If a machine travels 100 miles an hour in a wind of 40 miles an hour, the air speed is 100 miles an hour and the ground speed is 60 miles an hour; or 100 minus the wind speed of 40 miles an hour; which is 60 miles an hour.



Here is the Northrop Delta which is a development from the Northrop Gamma, the "Sky Chief," for air transportation lines. This plane has a top speed of 200 miles per hour and cruises at 195. It lands at 53 m.p.h. It carries a greater load than its own weight. When equipped with "flaps" its take off run is decreased 30 per cent. Letting the flap down adds 300 per cent resistance to the ship and about 35 per cent additional lift.

The Northrop Sky Chief in Detail

(Continued from page 20)

for the axles to fit through. Now turn out pieces ½" outside diam., drill 9/32" holes through them and cut them down to 3/16" lengths. These pieces act as the guides for the "yokes" or frameworks which are built around the wheels to hold the lower parts of the pants in place. Six pieces of tubing, four of them upright and two diagonals extend from the top of the yokes to the guides as shown. Drill 1/16" holes into the guides for these tubes to fit in; then build the yokes of 1/16" diam. tubing.

When the yoke framework is completed as shown, solder in a 1/16" thickness triangular shaped plate on each side of the framework, between the two diagonal center tubes (truss members), and drill a ⅛" hole through each plate for the wheel axles to fit through. Turn out the wheels and drill ⅛" holes through the centers of these also. Then slip the wheels between the forks, place them in the yokes and slide the ⅛" axles through the triangular plates, soldered in the yokes. Drill a small hole at each protruding end of the axles and force a pin or brad in the holes. Now place a ⅛" diam. spring into each shock absorbing "plunger" and slip the plungers into the fixed tubes of the upper portion of the landing-gear struts. The wheel pants are built in two halves consisting of upper and lower parts. The upper part is fixed into the center section of the wing. The lower portion of the pants is fixed to the yokes and slides up into the upper portion. The pants are made of (.007) gauge sheet metal, hammered out on a block shaped like the wheel pants.

First carve out a block of hard wood into the shape of a full wheel pant. Each of the bottom sections and top sections are made in halves respectively. Cut these out 5/16" longer at the front ends than the drawing shows and hammer them out to the proper shape on the already carved block. Now trim the ends until the two halves fit perfectly and connect them to the yokes soldering the seams firmly.

The Tail Assembly

The drawing of the rudder is shown on page 18. There are three ribs to it. Cut these ribs out as shown and put them aside. Now cut all the spars, then drill the holes in the ribs to correspond with the distance between spars. Solder them together, then go on to the fin and do likewise. Place the hinges level with the two top ribs on the fin and rudder and line them up. Now lay your metal skin over them and solder it in place. To get the effect of rivet heads, pinch the metal skin from the inside along the lines of the spars and ribs.

Elevators

The elevators and stabilizers are made the same as the rudder with the exception that the stabilizer has an adjusting tube, (for trimming the ship in flight), running from the front end of rib (c) out through the side of the stabilizer, ¼" into the fuselage (as shown in top view on page 16). A slightly larger tube slips over it inside the fuselage and connects both stubs. (The same applies to the rear tube.)

Do not cover the stabilizer until you have thoroughly adjusted it to fit the internal controls.

When all the rear empennage surfaces are finished, make the ailerons. These have the same construction as the tail surfaces. The perspective view, on page 16, shows clearly how they are connected to the wing. A length of tubing runs from underneath the control stick out into the wing and is connected to a triangular plate (as shown). A small push rod runs from this plate to the horn on the aileron. These controls operate internally the same as the tail group. The pillars on which the ailerons are fastened are built in two halves of (.0010) gauge sheet metal cupped together and soldered along the seams.

When you have all the controls working, disconnect them from the ship and lay them aside. Now you can start covering the wing and fuselage, using (.007) gauge sheet metal for this purpose. To cover the fuselage you must lay the metal strips along the full length of fuselage; each strip must be soldered from the center of one metal stiffener to the center of another. These are ½" apart between centers on a straight line (not around the outside of each bulkhead), therefore the metal strips which form the covering must be slightly larger than ½" at the widest point.

Cover all the fuselage except a small portion at the rear so that you may hook up the controls later. Then rub down the fuselage with medium emery cloth or steel wool to obtain a clean smooth surface.

Now cover the wing. This can be done either by laying one large sheet over the entire wing or by soldering strips along its full length as in the fuselage.

The Flaps

There are two flaps on the underneath trailing edges of the outboard wings which run the full length of these sections. These appear (page 16, top view) in dotted lines and the front of each is hinged on to the rear diagonal spars.

There are nine ridges (corrugations) on the flaps, one on each end and seven between them. These are 59/64ths" between centers ⅛th" wide and run to within 3/32" from each edge of the flap's width. There are four stiffeners on the inside of the flaps along their full length, ⅛th" apart.

Now hook up the ailerons and tail group. Make sure theat all the controls work smoothly before completing the covering job on the rear of the fuselage.

The Engine

When all this is done, start on the engine. First make a wood model of the crankcase and draw a line completely around its side. A small box of thick metal consisting of two halves and having a hole at each end should first be made. Each box should have flanges on the side by which the half could be clamped together. Fill one of the halves of this box with "casting sand" and press the model in until only half of it is visible. Then

(Continued on page 34)

"Without question the most complete and exhaustive book on model airplane construction published to date"

—UNIVERSAL MODEL AIRPLANE NEWS

COMPLETE MODEL AIRCRAFT MANUAL

By Edwin T. Hamilton

The Official Book of "Universal Model Airplane News"

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85 plans — 77 photographs
120 insignia — 500 illustrations
Aviation Dictionary — Dealer's list

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Curtiss Shrike YA-8 Attack
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Grant "Minute Man" Tractor
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Keeping Pace With Model Science

(Continued from page 22)

third and fifth place winning ships of Norman Schaller and Richard Vogt, who were successful in using eighteen inch props with one-eighth inch rubber. The r.p.m. of such large props was, of course, very slow.

The success of tear-drop shaped hollow motor sticks is well established. Model builders everywhere seem to be using them with good results. Their greatest difficulty was in making the wing clips to fit the sticks. To those who have tried it, this is all I have to say. They know from experience. So to these I am pleased to announce certain improvements which will greatly diminish their troubles with tear-drop sticks. The nature of the improvements is to be found in a study of the new cross-section developed by Laurence Smithline. Note that the sides are parallel for a little distance, allowing clips which are easier to make and with a better grip. Also, note that the cross-section is larger and uses slightly thinner walls. This produces a stick which will bend and twist only a very little under full power, because of the great rigidity of the large cross-section.

For making such a stick select a clear light piece of balsa 15″x1″x1/32″ and taper its sides to 3/4″ at each end, leaving it one inch in the center. Next, sand it down evenly throughout until it weighs from .014 ounce to .018 ounce depending on the size of rubber you wish to use. Make a solid wood former exactly like the finished stick is to be but thinner. Wet the balsa sheet in hot water (not boiling) and carefully bend it evenly around the former, bringing the edges together at the point and wrapping carefully with gauze about an inch wide. Then bake on a few sheets of newspaper in an oven at about 350 degrees for five to 10 minutes.

When dry, remove the gauze and the former and using a thin cement, lightly but thoroughly coat the edges of the seam several inches at a time, holding each few inches while it dries. No end plugs or bulkheads are required. As usual, cut the front end at an angle so the prop will clear without difficuty. Simply cap each end with 1/32″ sheet balsa. Tapered hollow tear drop tail booms are made as usual, but using a large cross-section with thin walls. The cross-section is shown in figure —

Now, to a discussion of actual, complete ships. First comes Laurence Smithline's 19 minute, 5 second tractor. He used a tear drop stick and boom as described above. His wing and tail were elliptical in shape. Wing span was 36 inches with area about 150 square inches. Tail had a 12″ span, 3 3/8″ center chord, area about 38 square inches and positive camber set at a small negative angle, about 2 degrees. Tail boom overall was about 10 inches with rudder below the stabilizer. The ship circled from right to left; that is, with the torque. Wing clips were about two inches high, and polyhedral elevated the tips about 3 3/4″ above the center of the wing. The clips were single balsa sticks, streamlined, with wire saddles at the lower end for gripping the 15″ stick. The prop was about 16″x 1″x1 3/8″ and used 3/32″ brown rubber, which was below the stick. The prop had rather less area than it could have, but had

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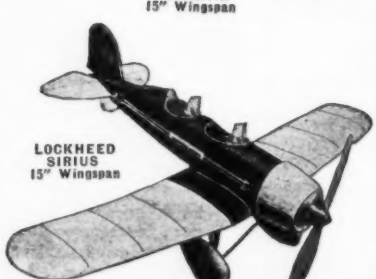

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it concentrated about at the middle of each blade. No angle of incidence was used in the wing which had a camber about 3/8" high in the center rib. Figure 1 shows this ship. Weight without motor .081 ounces.

My tractor, used in the Nationals, where it won fourth place with a flight of 16 minutes, 19 seconds, had a tremendous climb using a prop 15½"x1"x1 9/16" on 7/64" brown rubber. This climb made it difficult to control the ship so as to get high duration without running too great risk of sticking up in the rafters. Right after a 19 minute, 34 second test flight, which had six miraculous escapes from getting stuck in the girders, came the 16:19 flight, the last official one. Next test trial lasted 17:49. The ship has been flown a few times since the Nationals with a 16"x1"x 9/16" prop, using a cut-out leading edge to reduce the climb, and reeled off a 16:51 flight with 1800 turns put into the motor capable of 2400. About 200 turns were left. The wing was 40" in span. The construction is similar to Smithline's. The boom was 12" long, tear drop, tapered. The stabilizer had 10 inch span and 26 square inches area, but I've since changed it to 12" span with 37 square inches, which works better. Rudder was four inches high, set below the stabilizer, which was cambered and set at an average negative angle of about 2 degrees. Weight without motor .087 ounces. Fig. 2.

On September 9, during an official record trial contest held in New York, Allan Penn of that city set a new indoor commercial record of 10 minutes, 5 seconds. His fuselage was paper-covered and took the strain of the motor instead of using a motor stick. This practice, according to my figures, produces a stronger, lighter ship than when using a weak fuselage with a motor stick to take the strain. I use it in my own models. Pictures of Penn's ship are not available, therefore I include mine which embodies the same principles. When finished, I hope it will fly 12 minutes or more, whereupon Universal Model Airplane News may publish its plans. Penn used longerons about 1/20" square balsa. His prop was about 13"x7/8"x1½", and flew on 7/64" rubber. He used a double clip stick on top of the fuselage for mounting the wing and employed four clips. The tail boom was permanently set on the rear of the tail plug, which was removable for winding the motor. The rest of the construction was similar to that described above. Weight of ship .093 ounces without motor.

At the same contest my Baby R.O.G. set a world's record of 9:34, using about 2100 turns of a maximum 2300. The rubber was 1/32" square brown rubber, and the prop 8"x1"x5/8". Motor stick was a hollow tear drop, tapered, 8" long, and using no can. The landing gear was split type, because of the motor below the stick. Wheels were ½" diameter, 1/64" sheet balsa, with rolled paper hubs. Wing area was 30 sq. in., span 15", covering microfilm, camber about ¼" high. The boom was solid and tapered. Stabilizer had 5¼" span. Rudder was below the stabilizer and 2¼" high. Very slight negative evidence was employed on the stabilizer, and 1/16" positive incidence on the wing, with clips

(Continued on page 40)

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Parent's Signature required only if subscriber desires N.A.A. Membership.

The Northrop Sky Chief In Detail

(Continued from page 31)

fill the other side and press both halves together.

When the metal has been melted sufficiently, pour it into one of the holes leading into the sand. Do not place the hot cast into water or it may cause serious injury. Let it cool off by itself. When thoroughly cooled, remove cast and file off the rough edges.

To make the cylinders, turn out the barrel first on the lathe without any cooling fins, but leave a small extension at the bottom known as the "skirt," which sinks into the crankcase. When the cylinders have been cast this skirt can be slipped into the lathe, collet or chuck and the cooling fins then turned out.

Carve the cylinder heads of hard wood, then drill a small hole into the barrel and head and insert a nail or brad which will have a tight fit through both. Cast the cylinders in the same fashion as the crankcase and when finished turn out the cooling flanges as mentioned.

Drill 14 holes for the "cylinder skirts" to fit in, 7 in front and 7 at the rear of the crankcase. Scoop out the inside of the crankcase and drill a hole for the crankshaft. Slip the cylinders in place and solder or bolt them down to the crankcase. Now fasten a plate at the rear of the crankcase and drill holes into it to bolt on to the mounting ring. Before placing it in the "push rod" housing, be sure to clean the entire engine thoroughly.

The Propeller

The propeller can be made of any metal. Turn the blades on the lathe round, then grind them down to the shape of an airfoil but leave the end which fits into the hub round.

To make the hub you must first make a model for it, it being a three way affair. Make it of hard wood and use the same method of casting as the engine. Then drill out the holes for the blades to fit in and for the shaft to go through. Solder in the shaft, then insert the blades, fasten them and polish the finished job. When finished the prop. can be chrome-plated and will have a realistic appearance.

The Cowling

Now turn out the ending cowl from a solid piece of stock; scoop out the inside and when finished cut it as shown in front view, page 16. Solder hinges on the inside for convenient removal.

Clean off all the grime with gasoline and let the gas dry, then wipe off with a dry cloth.

Now the model is ready for painting.

For the best results use "Dupont" (clear) lacquer first, then mix "aluminum bronzing" powder wth "clear" lacquer and add some "lacquer thinner." Strain this out well before painting.

For the best paint job use a spray gun (De Vilbiss type) if possible for this gun is used by the leading auto manufacturers and turns out the best job.

Following is a description of the color scheme of the "Sky Chief":

Entire ship—natural aluminum finish.

The Texas Company trade mark—border and "Texaco," black; background, white; star, red; letter "T" green with black outline.

"Sky Chief"—green with black outline.

Arrow—red with green outline.

Fire Hat—red with blue shield.

Engine name and radio call letters—black.

Dept. of Commerce numbers—red with green outline and black outline around green outline.

Stripes on wheel fairing—red.

Northrop trade mark—red with silver background.

Model News From Other Countries

(Continued from page 14)

favoring monoplanes, we have published plans of the S. E. 5 in the March 1932 issue. Biplane builders will be pleased to hear that we intend to publish the plans of R. C. Crum's camera plane in the very near future, probably in the February issue.

Model Flying Club of Australia

As usual this organization has been very busy. This time it has been an exhibit which was sponsored by the Australian Broadcasting Co., Angus and Coote, and the M. F. C. of Australia. This exhibit was on Monday, Sept. 4. Mr. Nangle, Supt. of Technical Education, presented the prizes. The models remained on exhibit until Sept. 11th. Among the 70 types submitted by competitors, whose ages ranged from 10 to 34 years, were models of the famous Southern Cross, the giant Astraea, Royal Air Force fighters, and tiny machines measuring only 4" overall.

Picture No. 2 shows a group at the opening of this Second Annual Model Airplane Exhibit. In the picture can be seen the exhibit of solid scale models on the stage. In the background are the officials. This exhibit was open to all free of charge. No fee was required.

From Queensland comes picture No. 3. This shows members of the City Model Airplane Club of Brisbane. These young men refuse to use Balsa in the construction of their models. Evidently, they think it is "sissified" and that their strength and ability should be measured by a much more difficult problem, so they are using hard wood exclusively for the framework of their machines.

Mr. Freshman, secretary of the Club, tells us that, strange to say, in spite of this handicap, they get very fine flights which range from 60 seconds to 2 minutes. More power to these young men. However, we can tell them that they are missing a great deal by not using Balsa construction. Not only will their machines give finer flights, but they will find that it is easier to handle. I dare say that two Balsa machines can be built while one machine of hard wood is being constructed.

Picture No. 4 shows a very neat compressed air job just taking off the ground. It was made by H. R. Tanner of the M. F. C. It has a wing span of 5' 2" and is driven by a 3 cylinder compressed air engine, turning a 15" propeller. This is an exceedingly dependable flyer, but a flight never lasts more than 55 seconds R. O. G.

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I received the supplies I ordered and I am quite pleased with them. I found that you give much better service on the first order than any other company I have ever dealt with. Your balsa products are above the average, and I find that your ⅛ in flat rubber is much better than more expensive grades. As a large plane needs light materials, I find that your supplies are better than the supplies of many larger companies. I, for one, will stick to your supplies from now on.

Very truly yours,
BILL THOMAS
Swarthmore Apartments
Swarthmore, Pa.

Dear Sirs:

We received the supplies we ordered on the 26th of September and were very pleased with them. We received the two motors the 9th of this month and the rest of the supplies yesterday.

We were pleased with the way you pack your material. When we are ready for our next shipment you may be sure of our business.

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1/16x1/16	3 for	1c
1/16x3/32	3 for	1c
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1/16x1/4	3 for	2c
1/16x1/2	3 for	3c
3/32x3/32	2 for	1c
3/16x3/16	2 for	4c
3/16x5/16	2 for	5c
1/4 x1/4	2 for	5c
1/4x1/2	1 for	4c
1/2 x1/2	1 for	5c
1 x1/2	1 for	6c
1 x1	1 for	10c
1 x2	1 for	18c

SHEETS

1/100x2	1 for	7c
1/64 x2	1 for	6c
1/32 x2	1 for	2c
1/16 x2	1 for	3c
3/32 x2	2 for	7c
1/8 x2	1 for	4c
3/16 x2	1 for	5c
1/4 x2	1 for	7c
5/16 x2	1 for	8c
1/2 x2	1 for	10c
2 x2	1 for	25c
2 x3	1 for	30c
2 x6	1 for	55c

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1 ft. 1/16 O. D. 5c

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3/16 flat	50 ft.	27c

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1½" Diameter 15
2 " " .20
3 " " .30
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¾" diam. 05
1 " diam. 07
1¼" diam. 09
1¾" diam. 11
3¼" diam. 30

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1" diam.	4c pr.
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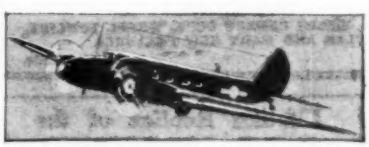

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Red, yellow, orange, blue, per doz. 15c

RUBBER
Per 225 ft. skein

1/32 sq. 25c
.045 sq. 40c
1/16 sq. 50c
1/8 flat 50c
3/16 flat 75c
Per lb. any size 1.20

COLORLESS CEMENT

Will not dry white; dries colorless
1/2 oz. tubes, per doz.....35c
1 oz. tubes, per doz. 60c
3 oz. cans, per 1/2 doz.....60c
1 qt. 75c
1 gallon (128 ozs.).....2.20

CLEAR DOPE

1/2 oz. bottles per doz. 30c
3 oz. cans, per 1/2 doz. 50c
1 qt. 65c
1 gallon 1.80

COLORED DOPE
All colors

1/2 oz. tits 1 doz. 35c
3 oz. cans, 1/2 doz. 60c
1 qt. 75c

WASHERS

Small, 100.....5c
Large, 100.....6c

Thrust Bearings

Small or large, per doz. 8c

BUSHINGS

Small, per 100.....15c
Medium, per 100.....20c
Large, per 100.....25c

CELLULOID WHEELS

3/4", per dz. 25c
1", per dz. 26c
1 3/8", per dz. 35c
1 7/8", per dz. 61c

BALSA WHEELS

3/4", per dz. 12c
1", per dz. 15c
1 3/8", per dz. 20c
1 3/8", per dz. 35c
2", per dz. 45c

PLANS

20" wingspan . . . detailed, full-sized, all formers on plans. Plans for following models: Lowing Boeing P-26, Boeing P-12E, Northrop Gamma (Sky-Chief), Spad, Sparrow Hawk, Curtiss Swift, Vought Corsair, Boeing Transport 247. 3 for 25c, 1 doz. 90c

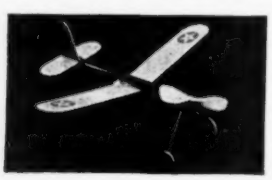
Carved Propellers

5" ..... 6 for 20c
6" ..... 6 for 24c
7" ..... 6 for 28c
8" ..... 6 for 32c
10" ..... 3 for 25c
12" ..... 3 for 29c

Wire

.014 ..... 100 ft. 16c
.018 ..... 100 ft. 18c
.020 ..... 100 ft. 20c
.028 ..... 100 ft. 22c
.034 ..... 100 ft. 25c

DEALERS! HERE'S A KIT THAT WILL SELL!



Introducing the 12" SKY KING—a new sensation.
A solid balsa R. O. G. kit that will appeal to the novice and expert alike. We guarantee the Sky-King to fly for hundreds of feet indoors or outdoors if properly built. It is very sturdy and will outfly the winter winds. Any beginner can build it in 10 min. and get remarkable flights. These kits sell themselves. Kit contains: ready carved balsa propeller, all parts stamped on balsa (no tracing necessary), complete full sized plan, tube of cement, rubber, bushings, etc., everything necessary to build complete model. Kit retails from 20c up. Add a doz. to your list of supplies or order a doz. separately. Sensational value at this price.

1 DOZ. KITS (packed individually and attractively)
Only $1.40

ORDERING INSTRUCTIONS

1. No orders under 2.50 accepted for supplies. 2. Orders for 1 doz. kits will be accepted—when ordering kits alone add 20c postage for first doz. 10c for every doz. after that. 3. When ordering supplies alone or supplies and kits, add 10% postage. Whenever possible, orders will be shipped via P.P.; but we reserve the right to return amount included for postage and ship via Exp. collect whenever necessary. 4. Remit by postal or express money order; when checks are sent orders will be delayed about one week. 5. Add 20c extra to Canadian order. All Canadian orders sent by Exp. collect. 6. All orders over 10.00 will be sent post paid. Liquids in gallon quantities not included but will be sent separately by exp. collect.

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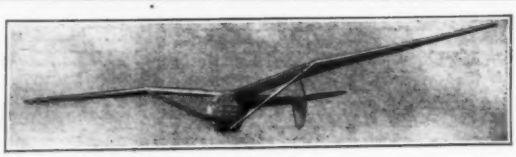
MODEL AIRPLANE UTILITY CO.
1140--53rd St Dept. DC Brooklyn, N. Y.

60" BOWLUS SAIL PLANE
DRAGON FLY
Unofficial Record 25 Min.

WILSON MODEL AIRCRAFT
Manufacturers
129 S. Howard St., Akron, Ohio



$1.75 P. P. M. O. ONLY U. S. ONLY
KIT CONTAINS BALSA TISSUE CEMENT DOPE, WHEEL TOWLINE, FULL SIZE PLAN AND MANY NEW FEATURES
Design—Lloyd Wellner Dealers: Write

Lifelike Replica of the
LOS ANGELES
with MOORING MAST

Now Madison Offers for the first time this New Model Creation

Build this realistic scale model of the world's oldest and most famous lighter-than-air craft—one of the most beautiful miniature models ever designed. Simple enough for anyone to build. The finished model is extremely desirable for decorative use.

Kit includes all parts to complete the ship and mast, with full size plan and instructions. (Length of ship 6¾"; height of mast 3"; colors: black and red; elevators and rudder; red, white and black.

Send now for one or more of these kits. Great for young and old.

KIT COMPLETE
25c
POSTPAID

MADISON MODEL AIRPLANES
134 LIVINGSTON ST. BROOKLYN, N. Y.

Dealers and Clubs:
Write for Special Discounts on this new Madison Creation.

Air Ways Here and There

(Continued from page 13)

has a wing spread of 8' 3" and an over-all length of 5' 2". It weighs 3 pounds. The construction is very sturdy, being composed of white pine, hard and soft balsa and basswood, two-ply square bulkheads of balsa giving the fuselage great strength. The wing is built in two sections with but a single strut for support when mounted. Regulation vertical and horizontal controls are used in the tail assembly. The propeller is 16" and is turned by a linked rubber band motor. Other details are 5" diameter wooden wheels and a wing chord of 11". It is covered with heavy rice paper. The total cost to build is $4. It has flown 125'.

In picture No. 7, Joe Battaglia, of 1367 Castle Hill Ave., Pelham Bay, N. Y., the expert scale model builder, seems very much interested in Leo Weiss' adjustment of the spark plug on his gas job. The Boeing scale model shown in the picture is one of the excellent jobs that has been turned out by Joe. Weiss' gas model has made a number of successful flights. You will note that it is very similar to Maxwell Bassett's National Contest winner of 1933.

We can see that Norville Schields, of 2106 N. 29th St., Milwaukee, Wisc., is a very fine workman. He does things in a fine manner. If you doubt our word, we invite you to look at picture No. 8, which shows his Vought "Corsair" 03U-4. The body was hollowed out from a solid block. In order to give the appearance of a revolving propeller, a disc of celluloid is attached to the engine shaft. That is not all. Notice the background of clouds. Actually they are not clouds at all but bunches of cotton batting hung up aainst a white background.

Clifford Hines, of 318 Brookings St., Sioux Falls, S. Dak., sends us picture No. 9 of his Jimmy Allen Blue Bird Racer in flight. This is a 3' high wing monoplane. In the picture it is about 50' high. Hines tells us that this model has flown 500' R.O.G. and is a very consistent flyer. For those readers who would like to have a plane which gives a good performance, I suggest that they write Hines for further details.

In picture No. 10 we see an 02-H Douglas Observation detail scale flying model. We do not need to tell you that this is a very neat and clever job when we say that it was made by Alan D. Booton, of 60½ Patton Ave., Asheville, N. C., author of many of our "Helpful Hints." This ship has a 30" span and is built with rugged construction to withstand hard wear. Considering the fact that this is a scale job, we wish to say that it is one of the finest flying ships we have seen. We hope to print the plans of it shortly.

CLUB NEWS

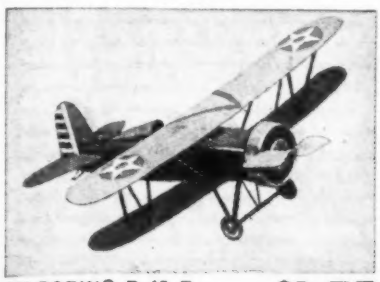
Bamberger Aero Club

The Bamberger Aero Club has been very active during the past season. On Sept. 1st, the first Model Builders' Convention ever to be held in America was held on the 10th floor of the Bamberger

(Continued on page 44)

Countless Thrills and Great Sport in Store for Builders of these HUB MODELS

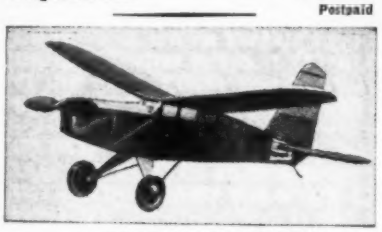
For More Experienced Model Builders who want the best. Here are three Flying Wonders. Buy one and we are sure you will buy all three. Like all other HUB Models, they have been carefully designed and are complete to the last detail, including 9 cyl. celluloid motors, drag rings and motor plates.



24" BOEING P 12 E
Weight 2.5 ozs. **$1.75** Postpaid

24" FOKKER HOSPITAL SHIP
Weight 1.9 ozs. **$1.75** Postpaid

24" CURTISS A 12 ATTACK
Weight 2.3 ozs. **$1.75** Postpaid



18" HUB SPEEDSTER

A real snappy looking Cabin Plane and what a flyer! This kit comes complete with stamped ribs, formers, etc.; formed wire fittings, plans, etc. Weight 1.1 oz. ..... **50c** Plus 10c Postage

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When ordering, remit by check or money order made payable to Hub Model Airplane & Supply Co. All Kits sent Postpaid. No C.O.D's.
Send 3c for Detailed Price List

.....*Known Everywhere for Their* {ACCURACY COMPLETENESS PERFORMANCE

Here's a line of HUB 24" Models that can't be beat anywhere for quality or price. Every kit includes a generous supply of what it takes to build a REAL Flying Model. Nothing left out. Many parts semi-finished. To build them is to enjoy them and you will recommend them to your friends. Here they are COMPLETE; ribs, formers and bulkheads clearly stamped on quality balsa, wire fittings ready formed, insignia, dope, cement, full size plans, etc.

ALL 24" HUB KITS SENT POSTPAID

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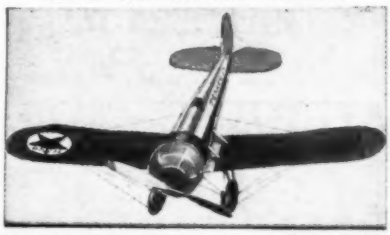
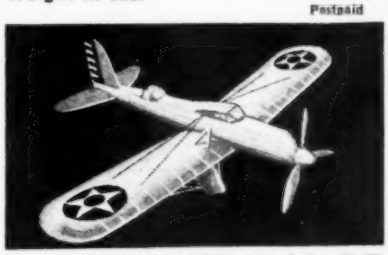
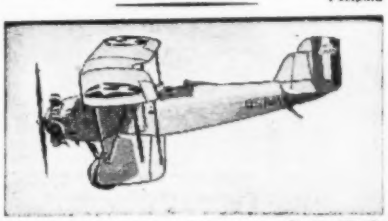


24" TEXACO "13"
Weight 1.7 ozs. **$1.25** Postpaid

24" MARINE FALCON
Weight 1.7 ozs. **$1.25** Postpaid

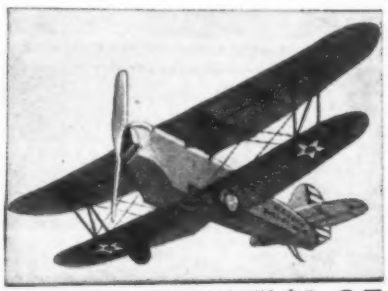


24" CURTISS A 8 ATTACK
Weight 2 ozs. **$1.25** Postpaid

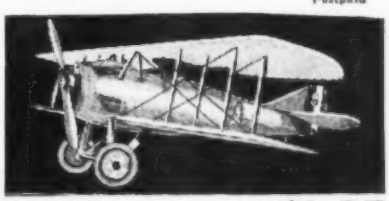


24" NAVY CORSAIR
Weight 1.8 ozs. **$1.50** Postpaid

(This kit also contains celluloid motor in addition to all other complete parts.)

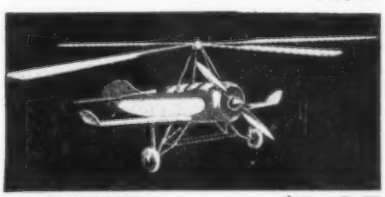


24" CURTISS ARMY HAWK
Weight 1.3 ozs. **$1.25** Postpaid



24" SPAD
Weight 1.8 ozs. **$1.25** Postpaid

24" FOKKER D VII
Weight 2 ozs. **$1.25** Postpaid



24" AUTOGIRO
Weight 1.2 ozs. **$1.25** Postpaid

HUB MODEL AIRPLANE & SUPPLY CO. 475 BROOK AVENUE BRONX, N. Y. (Dept. MA1)

The Aerodynamic Design Of The Model Plane

(Continued from page 23)

as long, then the beat will take place at each extremity of the swing of the large pendulum (OG), at (A) and at (B), fig. No. 51. This means that the disturbing impulses will be acting in unison at (A) and at (B) causing extreme instability.

If the long pendulum (OG) is an odd multiple of (PG), for instance five times as long, the beat will occur at the end of every full swing, at either point (A) or point (B), depending upon whether the plane has been tipped up at (A) or (B). At the half swing point the impulses will be opposite in direction and will dampen the rocking tendency. This condition is better than the first case, but not the best possible arrangement. If the long pendulum length (OG), for instance is five and one-half times the length of (PG), *neither* an odd or even multiple of (PG), then rocking tendencies due to the action of the two pendulums will never be traveling in the same direction at the extremities of the swing of (OG), (A) and (B). In fact, the two tendencies will buck or tend to neutralize each other. In this way, the rocking will be dampened.

This theory has proven to be true in actual flight tests of models. If a model has rocked violently when in flight, a slight change in the dihedral (and consequently in the *relative* length of the pendulums) has eliminated the tendency to rock and has produced extreme steadiness.

There are other features of design that cause lateral oscillation of the plane but they will be discussed under *spiral stability*.

This type of stability has been defined in previous pages of this series of articles but in order that you understand clearly what it is, its definition is given here again as follows: *Directional Stability* is that quality that an airplane possesses which causes it to resist forces that tend to produce a turning or a displacement about the vertical axis of the airplane, or which causes it to quickly regain its equilibrium if it is displaced by any influence. This axis passes vertically through the center of gravity of the airplane when it is in normal horizontal flight.

Many of you may have seen a model in flight, the tail swinging from one side to the other, so that the plane is not passing through the air in a direction parallel to the fuselage at all times. Instead it skids from one side to the other. Such a model is directionally unstable. This is a very dangerous condition, especially in a large plane as it is the primary cause of spinning or failure to "come out" of a spin.

Let us analyze the problem and see for ourselves what factors enter the problem and how we may use them to produce directional stability. We can see that the *fin* is an important factor, for any gust of air striking the fin from the side may cause a displacement from normal flight position, or force the ship back into normal flight position if it has been displaced previously.

If the fin area is small (less than 10% of the wing area in rubber powered models

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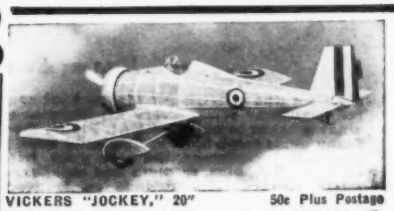
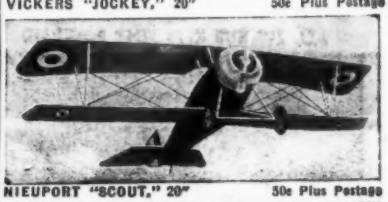
BUILD MODELS .. THAT DO THINGS



VICKERS "JOCKEY," 20" 50c Plus Postage



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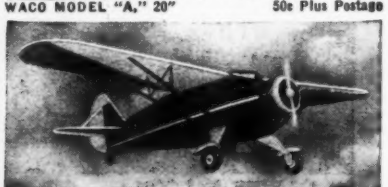

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You Will Experience Real Thrills

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GUARANTEED TO FLY!

Every Kit contains

Finished drilled propeller
Finished drilled wheels
Finished drilled nose plug
Finished wire fittings
All ribs, bulkheads, fairings, printed on balsa.
2 sheets colored tissue
Bottle banana oil
Tube cement
Washers
Rubber motor
All balsa strips cut to size
Full size plans and explicit instructions.

50c EACH

Plus 10c Postage For Each Kit

20" WINGSPAN

VANCE "FLYING WING," 20" 50c Plus Postage

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CAPT. HAWK'S **NORTHROP GAMMA** SKY CHIEF

Boys, here's the biggest thrill of all. A model packed with thrills in building, and thrills in flying. Amazing in the details it embodies. Exceptional in flying, flash, and maneuverability. This model has been thoroughly tested by our factory experts and found to be a capable and consistent flyer, often flying well over 600 feet—a remarkable performance.

The kit is complete with large full-size drawings and explicit instructions; all ribs, bulkheads, fairings, etc. clearly printed on sheet balsa, ready-made balsa cowling; ready made balsa wheels; ready-made nose plug; ready-made wire fittings; semi-finished three-bladed propeller; fine tissue; rubber; Scientific cement; banana oil; all balsa strips cut to size, etc. Wingspan, 22"; Length, 13½"; eWight, 1 oz. ..... **$1.00** POSTPAID

Remember there is only one . . .

SCIENTIFIC MODEL AIRPLANE CO.

277 HALSEY ST. DEPT. N-1 NEWARK, N. J.

NEW! Electrically driven SCIENTIFIC SPEED-BOAT. Will run 3 hours at 4 miles per hour. You can't really appreciate completeness of this boat until you actually see it for yourself. Complete, ready to run, with 4 batteries. PLUS 10c POSTAGE **$1.50**

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BALSA WOOD 36" lengths

1/16 x 1/16	8 for .05
1/16 x 3/16	7 for .05
1/16 x 3/16	5 for .05
1/16 x 1/8	5 for .05
1/8 x 3/16	3 for .05
1/8 x 1/4	3 for .05
1/8 x 3/8	.05
3/16 x 3/16	.02
3/16 x 1/4	2 for .05
3/16 x 3/8	.04
1/4 x 1/4	.03
1/4 x 1/2	.04
1/2 x 1/2	.08
1 x 1	.17

SHEET BALSA 36" lengths

1/32 x 2	.05
1/32 x 3	.08
1/16 x 2	.06
1/16 x 3	.09
3/32 x 2	.07
3/32 x 3	.11
1/8 x 2	.07
1/8 x 3	.12
1/4 x 2	.11
1/4 x 3	.18
1/8 x 3	.10
1/8 x 3	.16

1/64" BALSA SHEETS
1/64 x 2 x 18" Ea. .02

PROPELLER BLOCKS

3/8 x 1/2 x 5	.05
1/2 x 3/4 x 5	.07
3/4 x 3/4 x 6	.10
1/4 x 3/4 x 6	.07
3/4 x 1 x 7	.10
3/4 x 1 x 8	.12
3/4 x 3/4 x 7	.10
3/4 x 1 1/2 x 8	.19

JAPANESE EXTRA SUPER-FINE SILK TISSUE
Sheet 18" x 24" ea. .10

COLORED TISSUE AND WHITE SHEET .05

SCALE MODEL TISSUE 2 for .05

BAMBOO

1/32 x 1/4 x 8"	doz. .10
1/16 x 1/4 x 12	" .10
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1/64 x 1/64 x 12	" .05
1/16 x 1/16 x 12	" .05

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Scientific's new 16-page catalog crammed full of interesting information that every model builder will want to own. Send for yours now. It's absolutely **FREE.**

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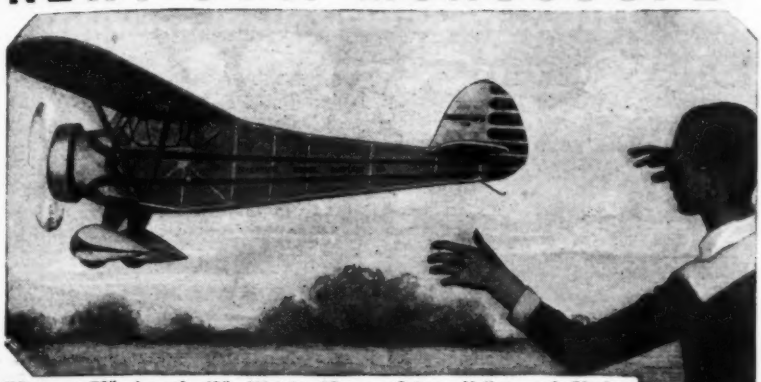
NEW! 6 FT. MONOCOUPE



Wingspan 72"—Length 43"—Weight 12 oz.—Colors: Yellow and Black

GUARANTEED TO FLY 500 FT.

Contents of kit:

Finished drilled propeller
Finished drilled balsa wheels with brass bushings.
Finished drilled nose plug with brass bushing.
Finished drilled balsa cowling.
Finished drilled balsa cowl front.
Finished wire fittings.
Tissue, rubber motor.
All balsa strips cut to size.
Large bottle banana oil, cement, and light-weight colored dope.
Full size plans and explicit instructions.

COMPLETE KIT

$5.00

Shipping Charges Collect
Plans alone $1.00

The Sensation of the Season!

Boy! Will you have fun with this model. When you go outdoors to fly it you had better have your auto handy . . . you may have to follow it all over the country.

She'll take right off the ground within 15 feet and climb high above the tree tops.

Just imagine—6 feet of model airplane all in the air at one time—and it took Scientific to do it because no one ever dared such a marvelous model at such a price.

DOOLITTLE'S GEE BEE SUPER SPORTSTER

A Model every builder should own. Can't be beat for appearance and performance.

Guaranteed To Fly

20" Wingspan

Complete Postpaid **$1.50**

Building and flying this Gee Bee will give you as great a thrill as though you were racing against Major James H. (Jimmy) Doolittle, himself. The model illustrated here is an exact copy of the "Big One." Perfectly designed and balanced. This is a model you'll be proud of for the rest of your life.

STINSON 26½" TRIMOTOR

A "knockout" for sturdiness and balance, and flies beautifully. Get your Stinson Airliner now—there's a thrill in store for you..... **$2.00** POSTPAID

2 ft. MONOCOUPE. What a Flier! What a Gift! Complete Kit Postpaid..... **$1.00**

2 ft. GEE BEE SPORTSTER. Complete and a winner!..... .....Postpaid **$1.00**

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CLEAR OR COLORED DOPE		1" diam.	pr. .05
1 oz. bottle	.8	1¼" diam.	pr. .06
2 oz. can	.15	1⅜" diam.	pr. .07
ACETONE OR BANANA OIL		1½" diam.	pr. .08
1 oz. bottle	.08	1¾" diam.	pr. .09
2 oz. can	.15	2" diam.	pr. .10
SCIENTIFIC CEMENT		2½" diam.	pr. .15
1 oz. bottle	.10	SCIENTIFIC RUBBER "The Best"	
2 oz. can	.18	1/16" flat	2 ft. for .01
Large tube	.35	1/16" sq.	2 ft. for .01
HARDWOOD WHEELS		3/32" flat	2 ft. for .01
⅝" diam. 1-1/16" diam., 1⅝" diam. Per pr.	.03	1/8" flat	2 ft. for .01
BALSA WOOD WHEELS		3/16" flat	1 ft. for .01
½" diam.	pr. .03	MUSIC WIRE	
⅝" diam.	pr....04	Straight 2 ft. lengths .010", .014", .017", .020", .028", .034" per length .01.	

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Send for discounts on Scientific kits. Scientific dealers everywhere are strong for our line.

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277 HALSEY ST. NEWARK, N. J. DEPT. N-1

and 7½% of the wing area in gas engine airplanes), the force exerted by a side gust upon it will not be very great. The effect of such gust in fact will be proportional in *intensity* to the area of the fin. The larger the fin, the greater the disturbing effect of such a force. However, if the tail of an airplane has been pushed sideways out of the path of motion, by a gust of air striking one side of the fin, the action of the air striking the other side of the fin due to the plane moving forward in flight, will cause the tail of the plane to be pushed back into position again. If the fin is large, the disturbing force will be large, but the intensity of the correcting force will also be in proportion.

Whether the fin is large or small, the *amount* of displacement will be the same. The only difference is that the period of swing or the time it takes for such a displacement and recovery is longer when the fin is smaller. A machine with a large fin will be displaced quickly by a side gust, but will recover its normal flight attitude quickly. Thus, we see that the fin can be a disturbing factor and a stabilizing factor as well.

There are other disturbing influences caused by the action of other parts of the ship or by forces generated within the ship which displace the ship directionally. One of these is the action of gusts on the wings, or effect of the operation of the ailerons. A gust of air striking one wing will twist the airplane around its lateral axis while in flight and thereby cause the tail to swing to the side out of the line of flight. The *fin* is the part of the airplane that resists and dampens out this motion of the tail of the plane. When the fin is forced sideways in such cases, out of the flight line, the air craft due to forward motion strikes it and forces it back into its normal position.

Thus we see that the *wings are a disturbing factor* and that in this case, the *fin is a corrective factor*. The greater the span of the wings, the farther out from body the gusts of air will strike them and consequently the greater leverage and disturbing effect they will have. The greater their span, the greater will be the directional instability of the airplane.

Thus, the fin area must be enlarged in proportion to the wing span, provided all other factors remain the same, so that the displacement due to the action of the wings will not be too great and that recovery is positive and quick. The larger the fin is made, the less will be the effect of these air gusts.

Many large plane designers do not believe in making the vertical tail surfaces large because, they reason, side gusts striking the fin cause frequent displacements and unsteady flights. They fail to consider that most of the displacements of this type are caused by gusts striking the wings, in which case a *large fin area* is of decided benefit. The side gusts striking the side of the fin actually are of small moment compared to the number and magnitude of gusts striking the wings. At any rate large fin areas insure rapid *recovery* from effects of this nature.

(Continued on page 40)

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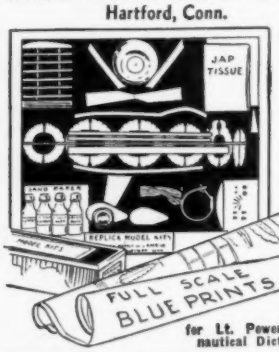

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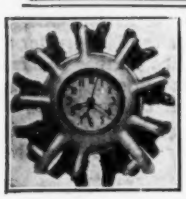

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Keeping Pace With Model Science

(Continued from page 33)

about 1" high, made of .010 music wire. Weight of the complete ship with motor about 11½" long was .028 ounce. Dihedral in each wing half was about 1½". Incidentally, this is the only official world's record I've ever held.

A new method for lightening props has made its appearance. It was first used, so far as I know, in Boston, and consists of what is known in the lumber industry as quarter-graining. Many of you have noticed that invariably one blade of the prop is both lighter and stronger than the other blade. By cutting both blades exactly alike out of the block it is possible to get both of them light and strong. The process is as shown in fig. 4. Shave off the end of the block with a razor blade and inspect it for certain fine lines, which will as a rule run at an angle to the faces of the block. The prop blades should then be carved so as to lie approximately parallel to these lines. The prop halves are cemented together after having been thinned down to about 1/16" thickness, but before shaping the central portions.

To sum up, then, I recommend the following with regard to building indoor duration models. Use the maximum wing area allowed under the N.A.A. rules, with aspect ratios ranging from eight to eleven. Use as large a prop as possible, without allowing its weight to go too high. It is inadvisable to have the pitch more than twice the prop diameter. Make your hollow sticks with fairly large cross sections. Elevate the wing some distance above the fuselage, and don't be afraid to use plenty of dihedral, which will make your ship more dependable. Make the prop quarter-grained, with a cut-out at the hub and taper the blade thickness from the hub outward. Use and experiment with microfilm. Have the stabilizer area no less than 1/5 the wing area and the overall length of the model no less than 2/3 the wing span. Learn ways to control the ship's flight. Try to get the maximum duration out of any ship you copy before you start designing them yourself. And along with high durations, seek dependability—it's the most valuable quality you and your ship can have.

The Aerodynamic Design Of The Model Plane

(Continued from page 39)

It has been a rule of airplane designers to locate the tail unit at a distance from the center of gravity (approximately on a vertical line through the center of the wings), which will be equal to one-third to one-half the wing span. In models it is advisable to make this distance equal to one-half the span. This distance is called the tail moment arm. If it is shorter than the length mentioned here the disturbing effect of gusts striking the wings will be very large unless the fin area is made of great size. Just as the wing gusts have greater leverage for disturbing the plane when the span is large, so has the fin area greater leverage for dampening and recovering from this effect when the moment arm is long. You can easily see that the longer the moment arm, the steadier the plane will be with any given amount of fin area. It is therefore a stabilizing factor. Then, too, the fin area may be smaller when the moment arm is long and yet have sufficient effect.

It is interesting to note also that the angular displacement of the plane is much less for any force acting to push the fin sideways, when the moment arm is long. The shorter it is, the more the plane will crab sideways. For increased directional stability it is advisable therefore to make the moment arm as long as possible. This must be within limits, of course, as the increased weight of an extremely long fuselage would be undesirable from a flight efficiency standpoint.

There are other elusive factors of great importance that affect the directional stability of an airplane, but we will leave the theories underlying their action for discussion next month.

On the Frontiers of Aviation

(Continued from page 7)

The guns are electrically operated and selector switches are provided so the pilot can cause any or all guns to fire when the control stick trigger is pressed. Standard A-3 bomb racks are carried under the lower wings, with controls in the pilot's cockpit. As in the standard two-seater "Corsair," provision is made for ready interchange of wheel type landing gear with single-float seaplane gear.

In its trials at Rentschler Field, the V-80, equipped as a land plane with full military load including a normal fuel load of 130 gallons, showed a top speed of 190 miles an hour, comparing favorably with the finest single-seaters in service.

The accompanying three-views show two different designs of the V-80, the lower one on the page being the design of the V-80 purchased by Great Britain. The other will probably be used by the United States.

The V-65-C has been the latest version of the "Corsair" of the two-seater type and because of its fine performance which follows, Japan has put in an order for several of these planes.

GUARANTEED PERFORMANCE OF THE V-65

	Landplane	*Seaplane*
High speed	170 m.p.h.	163 m.p.h.
Cruising speed	139 m.p.h.	134 m.p.h.
Landing speed	58.8 m.p.h.	59.7 m.p.h.
Range, high speed	415 miles	330 miles
Range, cruis. speed	610 miles	500 miles
Rate of climb	1550 ft./min.	1470 ft./min.
Service ceiling	20000 ft.	19500 feet
Gross weight	4380 lbs.	4520 lbs.

The General Aviation Clark GA-43

The General Aviation Manufacturing Corporation (formerly Fokker Aircraft Corp.), which has already distinguished itself with the designing of the well known Coast Guard twin-engined flying boat and the fast YO-27 observation plane, has now entered the commercial field with the introduction of the GA-43 and the GA-38. Since the introduction of the GA-43 in February, it has undergone severe tests that have proven the following

Performance:

Cruising speed at sea level	170 m.p.h.
Cruising speed at 5000 ft.	170 m.p.h.
Landing speed—no wind	63 m.p.h.
Rate of climb	1100 ft./min.
Service ceiling	18000 ft.
Range with full fuel supply	850 miles

Power Plant:
One engine—9 cylinder, radial aircooled..700 h.p.
Weights:

Useful load	3200 lbs.
Pay load with two pilots and fuel for 650 mile range	2000 lbs.
Gross weight	8500 lbs.

An enlarged pilots' cab has been built out on the GA-43 recently to provide for pilot and co-pilot where formerly there was only room for the pilot. The accompanying three views show both cabs.

One of the greatest features of the Clark GA-43 probably is the low flying cost to the transport operator which is afforded by only a single engine that pulls the large plane at an extremely high speed with a heavy load. This alone was the main reason why the Clark GA-43 was built.

The plane is built entirely of metal, its large cabin carrying a complement of ten passengers, providing a complete lavatory aft, a mail and baggage compartment under the pilots' floor forward of the passengers' cabin and another compartment in back of the lavatory. Large side windows of the pilots' cab may be opened independently, quickly and easily in flight and are practically draft-proof. A door leads to the pilots' cockpit from the passenger cabin. An interesting feature of the pilots' cab is its structure. Strength enough to hold the entire weight of the plane was incorporated into its design in case the plane should nose over (extremely unlikely in this type of plane), thus shielding the pilot or pilots from being crushed.

Two indicators show the position of each side of the retracting undercarriage. In flight the chief pilot is warned before landing if he should fail to extend the landing gear by a positive and reliable device which shakes the control column when the engine is throttled to a predetermined point. The action of the landing gear is simple, positive and reliable. The gear may be fully retracted in eighteen seconds and fully extended in seven seconds.

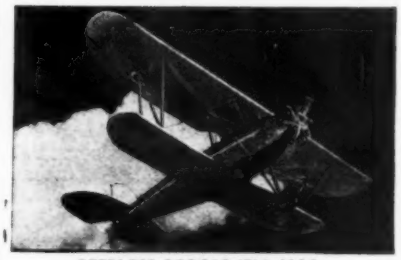
The plane has been designed to accommodate either the Wright Cyclone "F" or the Pratt & Whitney Hornet "C," both 700 h.p. radial, 9-cylinder, air-cooled engines. Special care has been taken to provide ready access to all parts of the power plant. Special rubber cylinders at rear of engine mount prevent transmission of vibration to the airplane. A fixed or controllable pitch propeller may be used.

The wing is a highly tapered cantilever using the Clark Y airfoil section covered by smooth Alclad sheet with a number of inspection doors. To permit steep slow speed glide and low landing speed, facilitating landing in a small field surrounded by obstacles, a Wright split trailing edge wing flap is provided. with pilot's control.

As a reward for producing such a fine airplane as the Clark GA-43, General Aviation has received orders from Japan, Switzerland, Western Air Express, TWA, and Pan-American Airways. An order will also probably come from American Airways, a closely related company of General Aviation.

The General Aviation GA-38

These planes when built will probably be used by TWA on its coast-to-coast service, together with the Douglas and Northrop transports.



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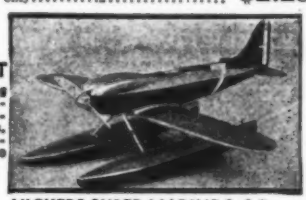

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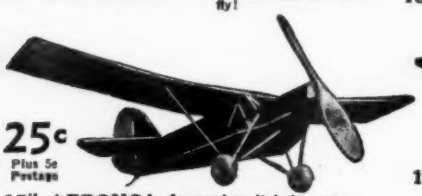

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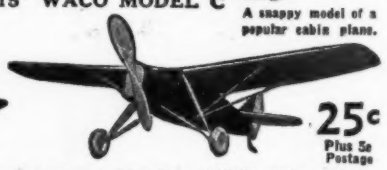

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How the Aeroplane Was Created

(Continued from page 9)

caused the wing beams to oscillate up and down.

Through this study of birds, Da Vinci gathered much important data on the habits of birds and also wing structures; and more important still is the knowledge of meteorology which he recorded by watching and observing bird habits. He gave much time and thought to mechanical devices for flying and even constructed models of paper and wire, operated by springs, using the helicopter principle of lifting, of which he may be said to be the inventor.

Unquestionably, he was the fore-runner of the school of thought which recognized the value of inherent stability as related to flight. His ardent desire to fly may be seen as the ruling passion in his life and to this end he bent every effort from the period of 1490 to 1514.

After Leonardo Da Vinci we find such names as Guidotti, Giovanni Baptisti Dante, and Allard; the latter of these attempted to demonstrate a glider for Louis Fourteenth.

The matter of the invention of the propeller or screw for motive power is a story of evolution rather than a single development. From the process of improving the supporting surface in the movement of the flapping wing, it was shown that propulsions could be had horizontally by a continuous circular motion and a constant pushing energy secured. Feathers and paddle-like devices were used in models until it was found that by literally boring a way through the fluid air, sufficient forward motion was secured. By rapid development and improvement the propeller finally became a most valuable adjunct to the final perfection of the aeroplane. Foremost contributors to this were Cayley, Penaud, Pettigrew, Henson and others.

Giovanni Alfonso Borelli, a professor of mathematics in Italy during the latter part of the seventeenth century, deserves a very important place in this history since it was he who advanced the idea of mathematics in this science and published many works to support his theories. Investigating the mechanism of bird wings, and constructing many models himself, he became convinced that it was impossible for man to fly by muscular effort unaided. He did not believe it possible for man to simulate the motions of bird wings successfully and gave his reasons why, even going so far as to state that he had little faith in any device designed to lift man from the surface of the earth. His foresight, however, is manifest in a discussion on means of landing at slow speeds, a matter of considerable interest even today. Many of his theories were followed by authorities as late as the nineteenth century.

In 1680, Robert Hooke, an English scientist, after careful investigation and experiment conducted along lines set by his predecessors, reaffirmed the theory that flight could not be made with the power available from human agencies alone, but that some driving force or power externally supplied was necessary.

This conclusion more or less settled the question then raging along this line, for we do not find many, and no great exponent of the ornithopter, or flapping wing principle, but rather a diligent search for motive power from some other source.

In 1768 Paucton designed a flying machine fitted with screws.

This, then, was what man was searching for, and at the opening of the nineteenth century we have a champion of this new line of experiment.

Sir George Cayley in England, was this man and with him started a new era which was destined to bring to man this much sought after achievement.

Heretofore, practically all endeavor was along the line of bird flight by various means of flapping wings or gliding with wings or supporting surfaces copied after birds. With the idea of a driving force, came the development of a new principle. By the discovery that a plane surface, if driven or forced through the air could take advantage of the resistance of its passage through that medium, and a lift created, a new field was opened up and the path to final success therefore made somewhat easier.

Just previous to the nineteenth century, partial success was had in the art of aerostatics or ballooning and man soon found himself aloft; but he was more interested in controlled flight, rather than be at mercy of the winds.

Therefore, in our next chapter we shall take up the advancement the nineteenth century has brought forward.

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Three 6" Kits	.30
Total Value	$1.65

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Heathe Quality Guaranteed Supplies

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1/32 x 1/16	.35 for .05	1/8 x 1/8	18	.05
1/16 x 1/16	.35	.05	3/16 x 1/16	12	.05
1/16 x 1/8	22	.05	3/16 x 3/16	8	.05
1/16 x 3/16	18	.05	3/16 x 1/4	5	.05
1/16x1/4	14	.05	1/4 x 1/4	6	.05
3/32 x 3/32	18	.05	1/4 x 3/8	4	.05

1/4 x 1/2	3	.05
1/2 x 1/2	2	.05

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3/8 x 1/2 x 5	8 for	.85
1/2 x 3/4 x 5	6	.05
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5/8 x 1 x 7	3	.06
3/4 x 1 x 8	2	.06
3/4 x 1 1/4 x 10	2	.09
3/4 x 1 1/4 x 12	1	.05
1 x 1 1/2 x 12	1	.07
1 x 1 1/2 x 15	1	.09

18" BALSA SHEETS

1/64 x 2	4 for	.10
1/32 x 2	7 for	.10
1/16 x 2	6	.10
3/32 x 2	5	.10
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3/16 x 2	3	.10
1/4 x 2	3	.12
1/2 x 2	2	.14

FOR 3" WIDTHS DOUBLE 2" WIDTH COST

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1" x 1"	1 for	.07
1" x 2"	1	.12
1" x 3"	1	.13
1" x 6"	1	.25
1 1/2" x 1 1/2"	1	.20
2" x 2"	1	.20
2" x 3"	1	.25
2" x 6"	1	.45
3" x 6"	1	.75

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1/16 sq. x 14	.33 for	.05
1/16 x 1/8 x 15	.1	.01

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2 oz.	1	.10
4 oz.	1	.19
1 pt.	1	.50
1 qt.	1	.90

CLEAR DOPE

2 oz.	1	.09
4 oz.	1	.17
1 pt.	1	.45
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THINNER SAME PRICE AS CLEAR DOPE

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White, yellow, orange, red, green, olive drab, blue, black, silver, gold.

1 oz.	1 for	.08
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white .....per doz. .20
colored asst. .per doz. .22

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3/8" dia.	pair .06
1" dia.	pair .08
1 3/8" dia.	pair .12
1 7/8" dia.	pair .16

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(small or large)

Each ..... .02
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WIRE
(in three foot straight lengths)

All sizes.....6 ft. .03

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1/16 or 1/8 dia., 5 ft. .02

Balsa Wheels
Machine Carved and Polished

1/2" or 3/4"	pr. .04
1"	pr. .05
1 3/8" pr. 7c; 1 7/8"	pr. .11

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1/32 x 1/32	30 ft. .05
.045 square	20 ft. .05
3/32 flat	20 ft. .05
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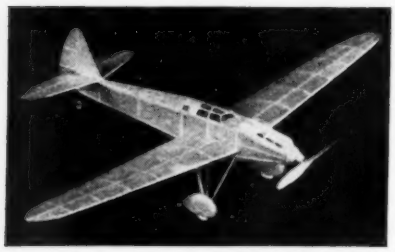
The New French Long Distance Monoplane Dewoitine D-33



Wingspan 27" Weight ¾ oz.

Due to the large wingspan, this model is exceedingly stable, and capable of long, graceful flights. Kit includes carved prop, turned nose piece, shock absorbing landing gear, semi-finished wheel pants, and everything needed to construct this beautiful scale model cabin plane.

PRICE 75c Postpaid

24" SHEET BALSA		CEMENT (Best obtainable)	
1/64 x 2	.03	1 oz. tube	.10
1/32 x 2	.03	1½ oz. tube	.12
1/20 x 2	.03	JAPANESE TISSUE ea.	.03
1/16 x 2	.04	ENGLISH PARACHUTE ea.	.04
3/32 x 2	.04	1/16 flat rubber 2 ft.	.01
1/8 x 2	.05	3/32 flat rubber 2 ft.	.01½
24" STRIP BALSA		1/8 flat rubber 1 ft.	.01
1/16 x 1/16 2 pcs.	.01		
1/16 x 1/8 ea.	.01	Include 10c to cover packing and postage on all orders for supplies.	
3/32 x 3/32 2 pcs.	.03		
1/8 x 1/8 2 pcs.	.03		

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Model Plane Builders

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BROWN, JR. MOTOR
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The Texaco Trophy at the **National Meet** at **Roosevelt Field, L. I.,** last June.

"Bill" Brown, designer and developer of these motors, has arranged to have his latest and improved motor for Model Airplanes manufactured and distributed by the

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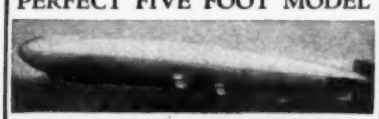

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Air Ways Here and There

(Continued from page 36)

Store Building, Newark, N. J. The leading model builders from New York and New Jersey attended and made reports of numerous experiments which they were making. The club discussed possibilities of radio controlled models, gasoline motor engines, different plans and methods of building and designing. All who attended were guests of The Bamberger Aero Club at a luncheon.

From Sept. 9th to Sept. 15th a Solid Scale Model Contest was held. The models built were of one particular ship, the Waco U.I.C. The judges are shown in picture No. 11 with some of the winning models. They are, left to right: Waldron Schantz, Bob Buck and George Viehman, transport pilots and Waco dealers. Two silver aviation trophies and three medals were presented to the winners.

Picture No. 12 shows the winners of the Fourth Annual Outdoor Contest, held on Saturday, Sept. 23rd, and one of the judges. Left to right, they are Walter Spokana, Alfred Higher, Henry Orzechowski, John Romanowski, Lt. Richard Aldworth, (judge), John Zeboyan, Alfred Docen, Fred Korn. Two new glider records were established.

On October 15th the Scale Model Contest, open to all model builders, was judged by Lt. Richard Aldworth, "Casey" Jones, and Lt. Col. George Vaughn. The models were exhibited in the lobby of the Terminal Theatre, Oct. 6th to 12th. Alfred Huber won first place. A silver trophy, two season passes to the Terminal Theatre and six aviation trainers were awarded as prizes. More than 1000 active members of the Aero Club attended a party at the Terminal Theatre. The Club members especially enjoyed an outing at the National Charity Air Pageant, held at Roosevelt Field, Long Island, recently. Two members of the Club acted as Field Messengers. Models of famous planes were exhibited by other members, which attracted a great deal of attention because of their fine workmanship.

Jordan's Junior Aviation League

From Boston comes news of great activity. Wilbur Tyler enclosed an unusual picture in his letter which we have put in the magazine under picture No. 13. Believe it or not, this is an 11′ rubber powered flying model. Tyler tells us that it is 14′. However, we have taken the liberty to change this dimension as we feel that its builder, Ben Badenock of Newton, Mass., who is holding the plane and whose head reaches above the center of the machine could not be more than 7′ high. We judge him to be approximately 5′ 8″, which would make the wing spread of this ship approximately 11′. The model is of original design and has made some remarkable flights. Conventional construction is used throughout. Badenock is one of the League's prominent builders and holds several Boston records in the Baby R. O. G. class. According to this information it looks as if Badenock runs to extremes. He certainly has a large range of action. He might write a story about his experiences entitled "How a Baby R.O.G. grew 11′ Wings."

Columbus Society of Model Engineers

This Club is one of the most active groups in the recent Ohio State Fair Model Airplane Contest. It was held Friday, Sept. 1st. The opening event, the Senior Outdoor Flying scale contest, was held at the Race Track Oval. This event was won by George Stultz of Columbus, Ohio, who flew his S.E.5 for 57 seconds. John Malloy won second place with his Monocoupe which flew 44 seconds. Following the flying scale event came the Wakefields. Paul Ford of Columbus, Ohio, flew his model out of sight for 192 seconds and won the event. Bob File won second place with a flight of 147 seconds.

It was interesting to note in every event the unusual designs and types used by the builders from different cities and towns. It seems that the builders from any particular city have distinct methods of design and construction.

One of the star performers was Harry Edsall's single stick pusher. This young man won second place with this machine in the Outdoor Senior Scientific event with a flight of 198:04 seconds. James Malloy, with a twin pusher, won the event with the flight of 258 seconds. Edsall's machine unfortunately flew out of sight before the flight was finished.

Picture No. 14 shows a group active at the contest. Left to right, they are: J. E. Konkle, Columbus, Ohio, Contest Director; Bob File, winner of the Senior ¾″ Non-Flying Scale; Billy Herbert, first place winner of the Junior Non-Flying Scale event, and George Ginn, first place winner of the Senior 24″ Non-Flying Scale event.

Billy Herbert's winner, a Boeing P-12 E, may be seen in picture No. 15. Bob File's Boeing P-12 E is shown in picture No. 16. They are certainly two very fine looking models. Bob File's model is equipped with an electric motor inside the fuselage to turn the propeller. We regret considerably that the lack of space here makes it impossible to print the complete list of winners and records at the contest. However, those who are interested may write to Mr. J. E. Konkle, 91 Whetmore Road, Columbus, Ohio, for further details.

Before we close, we wish to say a word about the Indoor events which were held Saturday afternoon, Sept 2nd, in the huge coliseum on the Fair grounds. One of the outstanding performers was James Neff of Dayton, Ohio, who flew his R.O.G. for 243:02 seconds. Paul Hoffman of Marion walked away with the Indoor Commercial class with a flight of 247 seconds. Harry Edsall won first place in the 15″ Scientific Class after considerable competition from Paul Hoffman, with a flight of 332 seconds. The contest officially closed at 6:30 P. M. Saturday.

The customary model builders' fatigue had overcome most of the contestants, for as experienced builders will know, the night before a contest is usually a sleepless one. Builders sit up all night to be sure that their models are in A-1 condition and

(Continued on page 46)

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1/16 x 1/8	24 for .05
1/16 x 1/4	24 for .07
1/8 x 1/8	24 for .08
1/8 x 3/16	24 for .09
1/8 x 1/4	24 for .12
3/16 x 3/16	10 for .06
3/16 x 1/4	10 for .07
1/4 x 1/4	10 for .08
1/4 x 3/8	6 for .08
1/4 x 1/2	6 for .09
3/8 x 3/8	6 for .09
1/2 x 1/2	4 for .10

Sheets—18" Lengths

1/32 x 1	4 for .03
1/32 x 2	4 for .05
1/16 x 1	4 for .04
1/16 x 2	4 for .06
1/8 x 1	4 for .05
1/8 x 2	4 for .09
3/16 x 1	2 for .05
3/16 x 2	2 for .08
1/4 x 1	2 for .06
1/4 x 2	2 for .09
1/2 x 1	2 for .10
1/2 x 2	2 for .13

PLANK BALSA

1 x 1 x 18	.08
1 x 2 x 36	.20
1 x 3 x 36	.25
1 x 6 x 36	.38
2 x 2 x 36	.40
2 x 3 x 36	.42
2 x 6 x 36	.75

PROPELLER BLOCKS

1/2 x 3/4 x 5	8 for .06
1/2 x 3/4 x 6	8 for .07
5/8 x 1 x 7	8 for .09
5/8 x 1 x 8	4 for .06
3/4 x 1 1/8 x 10	4 for .09
5/8 x 1 1/8 x 10	4 for .08
3/4 x 1 1/8 x 11	2 for .07
7/8 x 1 1/2 x 11	2 for .08
5/8 x 1 1/4 x 12	2 for .07
7/8 x 1 1/2 x 12	2 for .09
1 x 1 1/2 x 13	2 for .14
7/8 x 1 1/2 x 14	2 for .16
1 x 1 1/2 x 16	2 for .26

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Genuine straight grained, birch dowels.

18" Lengths

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3/16	.01½
1/4	.02

BAMBOO

Genuine TONKIN no-knot bamboo. Strong, light and splits easily.

1/16 x 1/4 x 12	.06 doz.
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A light, strong and high-grade material for covering models. Is excellent for doping.

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1 7/8"	.13 pair

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Very light, nine cylinder dummy radial engines. Adds a realistic touch to your plane.

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1/16 sq.	50 ft., .13
1/8 flat	50 ft., .13
3/16 flat	50 ft., .16

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3/16 O. D.	ft., .09
1/4 O. D.	ft., 11

DRAG RINGS

1"	.15
1½"	.15
2"	.17
2½"	.22
3"	.25

SHEET ALUMINUM

12" wide

.003	ft., .12
.005	ft., .12

N. A. C. A. COWLINGS

1"	.15
1½"	.15
2"	.17
2½"	.23
3"	.26

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Large size:

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The finest dope for doping your models

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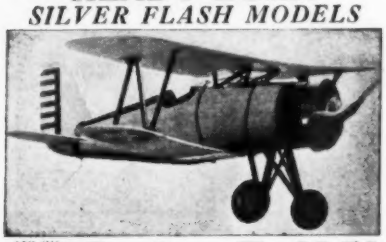

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Any model in larger 24" size 75c extra.

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7"	B/I XF-12	$2.00	6¾"	Curtiss A.10	$2.00
9¾"	Boeing Bomber	$3.00	8¾"	Curtiss A.12	$2.00
7½"	Boeing F4B-3	$2.00	9¾"	Curtiss Bomber	$3.50
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Air Ways Here and There

(Continued from page 44)

then they are about ready for the morgue. We wonder which is the better procedure: to have the models in good condition and the contestants in the last stage of fatigue, or the contestants with clear minds and the models in fair condition for the contest.

It seems that the South is not without its model aviation clubs. From Frampton Ellis, Jr., of 102 Peachtree Circle, Atlanta, Ga., comes news of a club which was formed in September and holds its meetings at Miller's Bookstore every week. It is called the Atlanta Model Airplane Club. Its first contest was held recently at the Municipal Airport. In spite of high winds, which made flying difficult, a good showing was made. Bill Paxton's Gordon Light fuselage model flew for 4 minutes. The events were Free-for-All, R.O.G., Flying Scale, Flying Fuselage and Scale Divisions, senior and junior. The Club will hold regular contests every 3 months.

Great interest is being shown in the Zip National Model Contest. Entries from all parts of the country are being received. This contest is being sponsored by the Aero Model Builders' Guild, Hempstead, N. Y. The contestants are to build a scale Douglas D. C.-I, the latest 15 passenger-transport, details of which were published in the December issue of "Universal Model Airplane News." The closing date of the contest is Feb. 28th. Several unusual prizes are being offered, including a 6000 mile trip by airplane with all expenses paid in the new Douglas D.C.-I and a 3000 mile trip in the same plane. This trip will be over the T.W.A. "Lindbergh Line." The third prize is an immense trophy which is being presented by the Texaco Co. The judges are: Capt. Eddie Rickenbacker, C. S. (Casey) Jones, Commander Frank Hawks, T. Park Hay (T. W. A.), Chas. H. Grant, Editor, "Universal Model Airplane News."

Bernard Stratton of 107 Bryan St., Houston, Texas, has recently organized a model airplane club in Houston. He is anxious to build up his membership and requests model builders in the vicinity to communicate with him. Incidentally, Stratton tells us that he has completed over 135 models in the last six years.

There were two exceptional flights in the Kansas City State Contest. Bob Loper's twin pusher flew 4 miles south of the field in 14 minutes, 8:4 seconds. On a trial flight Norman Koenig's all-wood, hand-launched glider was timed for 3 minutes, 15 seconds before it flew out of sight going strong.

CORRESPONDENTS WANTED

Henry Toll of 12 Snell St., Amherst, Mass., wishes to correspond with German model builders. Will our friends in Germany not come to the assistance of this young man.

Josef Feeder of 2618 S. 6th St., Philadelphia, Pa., would like to correspond with boys interested in model aviation. He is particularly interested in exchanging photos and negatives.

Eastern States Indoor Model Airplane Contest

(Continued from page 26)

open to any contestant who can come to it. New records are confidently expected.

Let your model building friends or fellow club members know of this big Eastern States Meet.

Send to Universal Model Airplane News, 125 West 45th Street, New York City, for registration blanks. However, stamped, return addressed envelope must be sent with your request, otherwise we will be unable to forward the blanks.

Registration Blank

Eastern States Indoor Model Airplane Meet to be held December 28th, 1933. All contestants must be on hand at 10:00 A.M.

Please enroll me in the following events of this meet. I hereby agree to conform to the rules and ethics governing all the competitions of the meet and accept the decisions of the judges as *final*.

Please check mark in front of event you intend to enter.

..... 1. Baby R.O.G.

..... 2. Hand-Launched Endurance

..... 3. Commercial R.O.G.

Age (last birthday) .....

Name .....

Address .....

City ..... State .....

Name of Club Represented .....

.....

Date of this Application .....

All Registration Blanks must reach this office by Tuesday night, December 26th, in order for the entrant to be eligible to enter this Contest.

UNIVERSAL MODEL AIRPLANE NEWS
125 West 45th Street, New York City

The Development of the Fokker Fighters

(Continued from page 11)

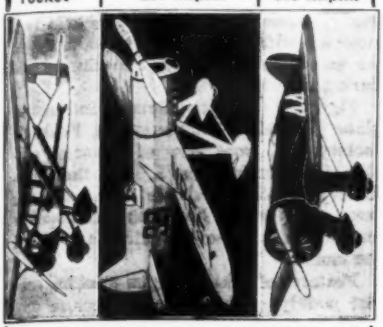
Germany's first aces were mounted exclusively on the Fokker monoplane type E. I. You will remember that the letter "E" stood for "Eindecker" meaning monoplane in German. Figure 1 of the photographs here shows perhaps the most historical of the line of Fokker aeroplanes. This is the aeroplane in which Boelcke won his first victory and the one in which Fokker refused to shoot down a French Voisin. It was in May of 1915 that Fokker monoplanes of this type began to send forth their death-dealing slugs. In general appearance the E. I was the same as the monoplane types heretofore described.

Steel tubing was employed throughout in the fuselage construction. Fabric covered the entire body with the exception of the usual aluminum-covered forward portion of the fuselage. A heavy landing gear composed of streamlined steel tubes welded together carried two wheels of small diameter. In order to reduce resis-

AIRCRAFT

4911 CORNELIA CHICAGO, ILL.

Bellanca "Sky-rocket"	Howard's "Mike" 281 m.p.h.	Wedell Williams 315 m.p.h.



35 CENTS EACH, 3 FOR $1.00

THREE WORLD FAMOUS PLANES, designed with the same care that is characteristic of Modern Airplane construction perfectly scaled, detailed and complete in every respect, each Kit includes, finished balloon type air wheels, semi finished nose or cowling, die cut letters, full size plans, piano wire, cement, banana oil, brass propeller bearings, wheel bearings, grade A rubber, smooth highest quality balsa wood, extra fine tissue and everything needed to construct these 13 inch perfect flying models.

MADE TO FLY AND SATISFY

Model Builders We carry the Largest variety of

KITS, SUPPLIES AND PLANS

CONSTRUCT-A-PLANE IDEAL
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SELLEY • VIKING • ALLENTOWN

All at Regular Advertised Prices

Buy your favorite models and materials from one concern. No advance in prices but an additional advantage of Service and you save on postage and extra shipping charges. Just send us one order for all your needs, and add 10% of entire amount of order. (West of Mississippi add 15%).

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Pay us a visit. New 8th Ave. Subway to 207th St. Sta. or I.R.T. Subway to 215 St. Sta.

Open Evenings, Sundays and Holidays

Model Builder's Kit $1.45

Consists of Balsa Strip Cutter, 94 page Miniature Aircraft Instruction Manual and enough Balsa Wood, wire, rubber, cement, paper, etc., to make the Sullivan 36 minute tractor and an R.O.G. Model. Book contains complete instructions for making both along with several other power models and gliders. Also an excellent explanation of the laws of flight. Fully illustrated.

Book only, postpaid 50c
Balsa Cutter only, postpaid.....50c

Wood and materials not sold alone.
No stamps please

Hetherington Mfg. Co.

4526 Corliss St., Los Angeles, Calif.

tance, the wheels were carefully covered. Shock absorbers were located as usual inside the fuselage on the forward landing gear strut.

Since the E. I was hardly an advance in design or construction over the previous monoplane types, its only radical feature, the synchronized machine-gun and mounting will be described in detail. As can be seen in figure 2, the parabellum air-cooled infantry type machine-gun was merely fastened to the top of the cowling in front of the pilot. In order to do this it was necessary to remove half of the windshield.

Inside the fuselage just aft of the firewall the cartridge belt chambers were arranged so as to be easily replaced or repaired. The cartridge belt in place and its streamlined cover are plainly shown in figure 2. This gun was timed to shoot 600 rounds per minute when the engine was running its normal speed of 1200 revolutions per minute. In the original arrangement, the spent cartridges were allowed to be ejected directly from the firing chamber but in later models, a chute was built in to prevent the brass from damaging the plane or hitting the pilot.

The same picture shows details of the center cabane to good advantage; the pulleys which carried the wing warping cables, the cockpit with several instruments, the "stick" and numerous other details. Specifications of the Fokker E. I will prove interesting:

Engine:	Oberursel 80 HP
Length O. A.	22' 3"
Wing span	29' 6"
Height	9' 6"
Weight empty	787 lbs.
Weight loaded	1240 lbs.
High speed	80.5 m.p.h.
Climb	500 ft. min.

After the E. I had scored a conspicuous success on the front although not originally designed as a gun fighter, Fokker again took to the drawing board. With lessons learned with the E. I and with new ideas about this new science of aerial warfare, he designed the E. II. Although very much alike in general appearance, the Fokker types E. I and E. II were far from the same in size, weights and details.

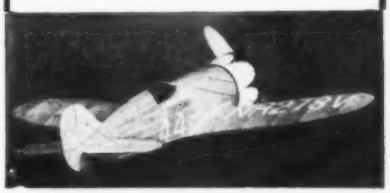
The thin monoplane wing was made up of built-up spruce ribs mounted on two main spars and the heavy leading edge. Every fourth rib of the thirty employed in the wing was located in line with a steel tube compression member bolted between the main spars. A thin wooden trailing edge was needed to provide the necessary elasticity for wing warping. All internal bracing wires were guarded against possible rubbing. Wing stubs were held to the fuselage by fittings welded to uprights about twelve inches below the cockpit. Contrary to previous practice, there were no windows provided in the wing for downward vision. Wing warping still prevailed for lateral control.

Steel tubing of small diameter and gauge formed the outline of the tail assembly. Several methods of construction were used in addition to all-wood or all-metal framework. Each type, however, employed metal tubing for outlines.

Pioneered by Anthony H. G. Fokker,

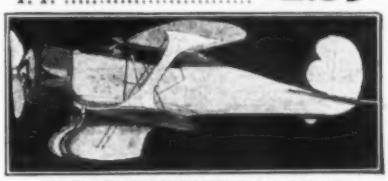
BOYS—

Your Christmas is incomplete without a PIONEER kit!



"WEDELL WILLIAMS LAND PLANE RACER"

An authentic reproduction as only Pioneer can build it. Big 26" span model—wt. 2 oz. Complete kit with hand carved prop. P. P. $2.35

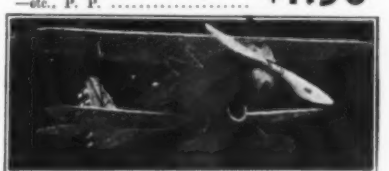


200 M.P.H. BEECHCRAFT CABIN PLANE

Something new in models—inverted stagger wing arrangement—a keen 20" flying scale model of the new fast Beech cabin biplane. Note clean streamlines. Kit is complete—easy to assemble—with full-size layouts and 3-view drawing. Kit complete, P. P. $1.25

HOWARD DAILY NEWS TROPHY PLANE

Here's one of the "sweetest" flying models you ever flew. Snappy — speedy lines, big 20½" wing span—wt. ¾ oz. Complete kit, all stock to dimension, full-size plans —etc., P. P. $1.50



HAWK, PRIDE OF THE PURSUIT!

Designed to stunt just like the real ship—will fly inverted. A neat, detailed model, 15" span —very easy to build, due to Pioneer's copyrighted method of building, P. P. $1.10

Model Flyer's Guide and Catalog..... 10c

Postal Insurance 5c extra

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CHAMPAIGN, ILLINOIS

MORE HOURS IN THE AIR

Keep your model planes flying. Build them with Duco Cement—and they will be stronger. This wonderful du Pont adhesive has a bulldog grip.

Duco Cement is *transparent*, waterproof, quick-drying, flexible, easy to use. 25c a tube at leading stores. Send for free plans of flying model of Sparrow Hawk and Duco Cement folder to DU PONT. Dept. U-1, Wilmington, Del.

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AIRPLANE Photos, 2½" x 3½", Gee Bee "D," Cessna, Waco F2, Waco C, Robin, Helldiver, Fairchild 22, Ford Tri-Motor and 15 others, 5 for 15c postpaid. Send for Free List. (Coin; not stamps.) N. E. D'Apuzzo, 32 St. Marks Pl., Bklyn, N. Y.

WE ARE General Headquarters for leading nationally advertised lines of Model Airplane Kits and materials —Selley, Ideal, Cleveland, Scientific—all at regular prices and guaranteed not only by manufacturer but also by us. Every kit doubly inspected before delivery. Buy your favorite kits at one place. Save postage and get personal attention. Send for price list. Bil-Day's Model Supply, 564 Flatbush Ave., Bklyn, N. Y. (Bklyn Boys! Take BMT Brighton to Prospect Park Station near Lincoln Rd.)

FINE Blueprints of Curtiss and Consolidated Airplanes. Hawk "P6E," Hawk "P3E," Falcon "039" (Both Cycone) Swift "XP934," Helldiver "F8C4," Fleet, Fleetster "20," and "17." Large, accurate, detailed, 25; each plus 5c postage. Engineer Design, 86 Stevens St., Lockport, N. Y.

15" SEMI-FINISHED flying model Curtiss Robin or Fokker D7, only 50c postpaid. Send for price list. Federal Model Airplanes, 795 Linden Blvd., Bklyn, N. Y.

MARVELOUS new engineering system can construct flying airplanes from one ounce to five pounds. Minutely accurate. Technicalities simplified. 10c coin pasted on letter brings information. R. Ferguson, Model Aircraft Engineer, 2121 Wellington St., Montreal, Canada.

22½" SCALE Plans, $1. Camel, S.E.5, Hawk P5, Curtiss Racer, Swift, Autogiro, P-12-F, B/J Seaplane, Halberstadt, Boeing Transport, Fokker Tripe, Albatross, Hawker Fury, Bristol, Supermarine, XP 936, B/J. 16, Navy Racer, Hawk P 6 E, Pfalz, Spad 13, Boeing Bomber. All for $1.00. Hawk Model Aeroplanes, 4944 Irving Park Blvd., Dept. U1, Chicago, Ill.

20" FLYING Model Kits, containing printed parts, propeller, etc. Northrop Gamma, Spad, Curtiss Swift, each 60c. Catalog Free. Hawthorne Model Aero Co., Hawthorne, N. J.

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SAVE Money! Balsa Scrap Bundle. All wood usable. Liberal assortment of strips, sheets, blocks, $2.00 value for 75c postpaid. Limited supply. Model Co., 1140 53rd St., Bklyn, N. Y.

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12" FLYING Boomerang! 10c postpaid. Lehman Boomerang Mfg. Co., 109-44 120th St., Richmond Hill, N. Y.

STUNTER Crash-proof, spin-proof. Gracefully loops, zooms. Will do 3 or 4 snap rolls while climbing on propeller. Kit 10—50c. Richard N. Rioux Model Airplane Specialties, Box 354, Highland Park, Ill.

DEALERS and Clubs—Write for our Price List of Model Airplane Supplies. We guarantee you won't be sorry. Prices lower than ever! Wholesale only. United Model Supply Co., P. O. Box 351, 16 Court St., Bklyn, N. Y.

JAPANESE Model Airplane Tissue, 32 colors, also Wood Veneer. Send for samples. See our ad. this paper with Jap. Girl's Face. Whitfield Paper Works, Importers, 12 Vestry Street, New York City.

AIRPLANES—EQUIPMENT

USED Airplanes $85.00 and up. Sensational bargains. Literature 10c. Federal Equipment Co., Dept. 10, Deerpark, Ohio.

BROTHER can you spare a dime? If you can, send it to me and I'll send you my 1933 Low Priced Aviation Material Catalogue. Karl Ort, 699 W. Poplar St., York, Pa.

steel tube construction naturally continued to find its way into the fuselage framework of the Fokker E. II. Nine vertical members were welded to the four longitudinals which formed the general body outline. Double lengths of steel wire looped around quadrants welded to uprights and longerons prevented excessive tortion of the body. Because of the greater horse-power of the E. II a rather heavy motor mount was used and at the same time the center of gravity was moved forward several inches. As before, aluminum was used exclusively for covering the forward part of the fuselage. Certain changes were made in the landing gear, principally made longer. At the same time, a larger, higher pitch propeller was used. In addition larger diameter wheels were used on the E. II.

In the E. II, the machine-guns were built into the aeroplane instead of being added after the plane had been completed as was the case of the E. I. In the new type the gun was changed to a Spandau air-cooled type, then coming out in great numbers. Figure three shows the E. II and the gun very plainly, also the identification mark on the fuselage. In line with a larger aeroplane, the center section cabane straddling the machine-guns was made considerably lower and of heavier stock.

When the E. II came out in July of 1915 it was immediately termed "The Terror of The Air" because of its high speed (for that time) and excellent maneuverability. To be sure, Germany had the finest fighting aeroplane in the world when she purchased the Fokker E. II. It could dart wasp-like from a cloud and pounce upon a slow moving Voisin or Farman and literally "burn" the occupants with hot lead from its Spandau gun.

Good design was largely responsible for the improved performance of the E. II as given below:

Motor:	Oberursel 100 HP
Length O. A.	23′ 10″
Span	31′ 5″
Height	7′ 11″
High speed	86.8 m.p.h.
Weight empty	880 lbs.
Weight loaded	1430 lbs.
Climb. ft. per min.	700
Ceiling	1200 ft.

To complete this trio of 1915 monoplanes we must include the "bad boy" of the Fokker line, the E. IV. The E. III and E. IV types were almost identical except for the armament arrangement, two machine-guns on the E. IV and three on the E. III. And thereby hangs a tale.

At the time Fokker brought out the E. III in August of 1915, Max Immelmann was well upon his meteoric rise to being Germany's aerial hero. He had achieved conspicuous success with the Fokker E. II monoplane and for this reason, the government felt it should build Immelmann into a sort of demi-god, a super-man for the people of Germany to look up to and revere. Probably the best way to accomplish this, the government thought, was to provide Immelmann with a super-aeroplane. At that time Fokker was the second hero of Germany by virtue of his synchronizing gear, and so was called upon to build a "super" monoplane that would make Immelmann complete master of the skies. While building this special monoplane, Fokker included all the latest ideas he had, especially bracing every part for the 160 HP Le Rhone motor that was to be its power plant. Aside from the nearly doubled power, the plane was equipped with three machine-guns shooting 1800 rounds a minute, a terrorizing hail of lead.

It earned its name of "bad boy" while Fokker himself was demonstrating its three guns before a group of pilots. One of the guns jammed and had riddled the propeller. Luckily enough, Fokker landed safely. Sometime later, while Max Immelmann was flying over the lines in it, a rocker arm of the motor broke in flight. It cut through the steel engine supports and the motor shook itself completely loose from its bed. With the motor hanging on by one twisted tube, Immelmann effected a safe landing, forced down behind his own lines. Fokker himself admitted that it was an unlucky plane, although Immelmann managed to gain two victories with it. This was said to be the only three-gun pursuit machine built during the war.

Figure 4 shows the Immelmann monoplane just after completion at Fokker's factory. A front view of the same machine is shown in figure 5. The three gun battery is plainly visible here, also the three cams, two in line with the propeller and one in a vertical position in front of the motor.

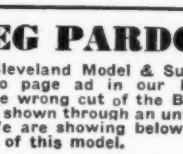
Features of this three-gun machine consist mainly of its strong structure and careful streamlining. The regular fuselage design was strengthened with additional brace wires and heavier tubing. An extra high cabane was needed to tie stronger rigging wires. Aluminum workers did their share in the streamlining of the three gun butts, done in the same way by the builders of the English Camel some months later. Indeed this was an aeroplane for an ace, but after a series of accidents, production of this type was stopped and from the Immelmann plane the E. IV type was evolved. Firing two machine-guns, the E. IV was the last Fokker monoplane to go into active service until October of 1918. Specifications and performance details of the Fokker E. IV are:

Motor	100 HP Oberursel
Weight empty	1025 lbs.
Weight gross	1590 lbs.
Length O. A.	24′ 10″
Wing span	33′ 0″
Height	9′ 2″
High speed	99.0 m.p.h.
Climb, ft. per min.	1100

Next month part six of this series will present pictures and descriptions of aeroplanes with which Fokker competed unsuccessfully with the Albatros company; how the Albatros D. I superseded the Fokker monoplane, and the Fokker types that finally evolved into the D. I.

BEG PARDON

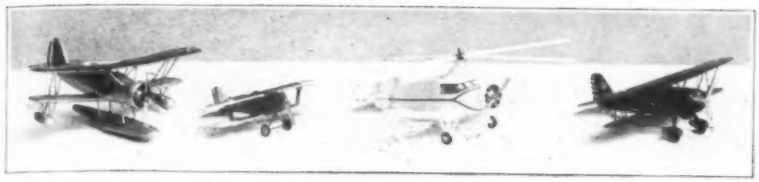
In the Cleveland Model & Supply Co., Inc., two page ad in our December issue, the wrong cut of the Buhl Bull-Pup was shown through an unfortunate error. We are showing below the correct cut of this model.



Moreover, the picture of their new Lincoln Sportplane, together with descriptive copy was left out of the ad by accident. Here is the picture and copy as it should have appeared in the ad:

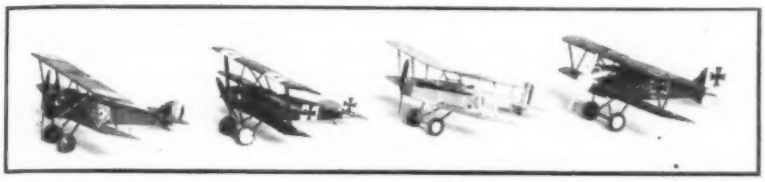
1932 Lincoln Sportplane

Span 15", length 12⅛", weight 1 oz. Colored cream and black. Kit SF-36, only .. $1.50



B/J SEAPLANE NAVY RACER AUTOGIRO CURTIS HAWK P.6 E

CURTISS SWIFT BOEING XP 936 BOEING P-12-F B/J. PURSUIT



CAMEL FOKKER S. E. 5A ALBATROSS

Pfalz D111 BRISTOL FIGHTER SPAD 13 HALBERSTADT

HAWK P-5 CURTISS RACER HAWKER FURY SUPERMARINE

BUILD 4

Exact ¼-Inch to the Foot SCALE MODELS

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NOW, you can build four exact scale replica models of the world's most famous aeroplanes for $1.25. Each kit set contains all the wood parts CUT TO OUTLINE SHAPE as, fuselage, wings, elevator, rudder, and pontoons. These parts are cut from Balsa for all planes except the B-J Seaplane, Boeing P-12-F, Autogiro, and Boeing XP936 which come with pine parts only. Scale die cast propellers, wheels, and radial motors are also included in the kits; together with a full size scale plan, paint, cement, insignia, and other materials needed to complete each plane. These construction sets build up into solid wood exact scale models, and when completed represent the last word in solid scale model building.

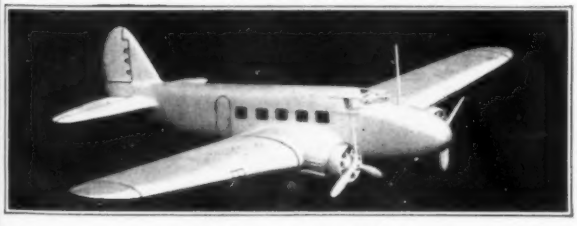
These kit sets are not to be confused with the 6 inch replica model kits supplying only blocks of wood and selling at a much cheaper rate. When you consider that all the wood parts for OUR KITS come cut to shape, the propellers ready to mount, wheels cast, and each ship is exactly ¼ inch scale to the "proto type" it represents, you will agree that we are producing kit sets far superior to others on the market. The wing spans for these planes vary from about 6 inches for the Curtiss Racer to over eleven inches for the Bristol, according to the size of the real aeroplane.

Choose any four of these planes pictured here and send us $1.25, and we will send the kit sets to you postpaid.

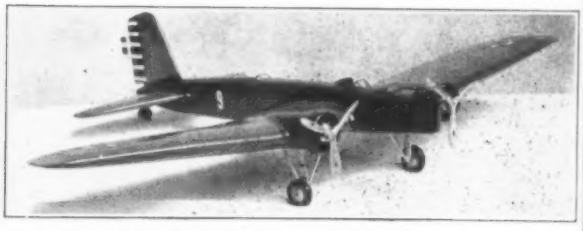
Note: This does not apply to the Boeing Bomber or Transport.

These models were exhibited at the World's Fair in Chicago, 1933

BOEING TRANSPORT



BOEING BOMBER Y1B-9A



Now you can build the Boeing Transport or the Boeing Bomber pictured here and have an exact ¼ inch scale replica model for $1.65

The kit sets contain all the wood parts cut to outline shape, two scale die cast Wasp Motors, two scale die cast three bladed propellers, all ready to mount, and cast wheels. These castings are made of Brittania metal and do not have to be hand finished. A full size 18½ inch wing span plan, glue, paint, etc., comprise the kits. When you consider that the fuselage, wings, rudder, and elevator are cut to shape and NOT blocks of wood, motors and propellers are ready to mount, and the size of the plane, 18½ inch wing span, you will realize we have produced a construction set that is in a class by itself. We Guarantee these kits to be as stated, and know you will be satisfied.

These kits can be had in either balsa or pine at $1.65 EACH, Postpaid.

HAWK MODEL AEROPLANES

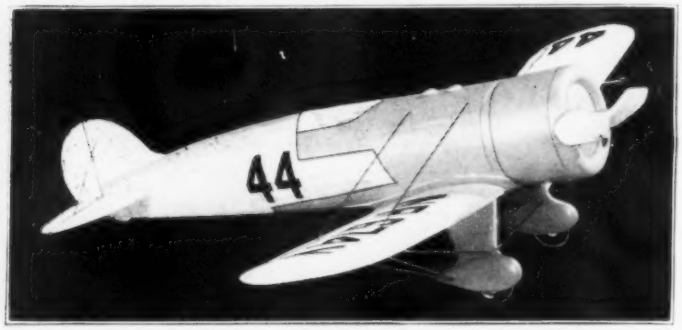
4944 Irving Park Blvd.. *Dept. H 3* CHICAGO, ILL.

CHICAGO'S OLDEST MODEL AEROPLANE ESTABLISHMENT

10½ HOURS FROM COAST-TO-COAST!

—and COMET BRINGS YOU THE MODEL!

25½ WING SPAN—ACCURATE FLYING SCALE

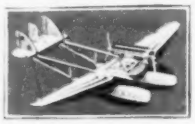


The design and construction of the Wedell Williams shown above is typical of Comet's leadership. Comet uses a simple system of fuselage construction which makes this model easy to build. The large, actual size plan is carefully engineered, not merely drawn up in any old way—and is chuck-full of details. All formers, bulkheads, etc., are imprinted on Balsa wood—all you need do is cut out the parts with a razor blade. Difficult parts are semi- or completely finished. And Comet gives you plenty of surplus material..... $1.95

COL. ROSCOE TURNER BREAKS RECORD WITH NEW WEDELL-WILLIAMS!

No sooner had the news of Col. Roscoe Turner's dramatic dash across the country been flashed to a waiting world, than Comet engineers set to work to create a model of this history-making plane! Now you can have it—the Wedell-Williams—in a big 25½" wingspan model—the plane that holds the world's speed record for land planes! Order it now—build it now—be one of the first to own and fly a model of this record-breaking plane!

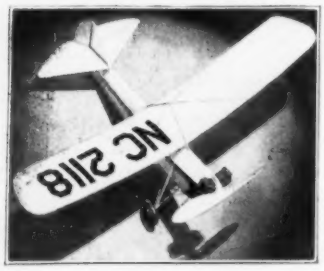
THE BALBO Non-Flying Solid Scale



"Wing span 13½"

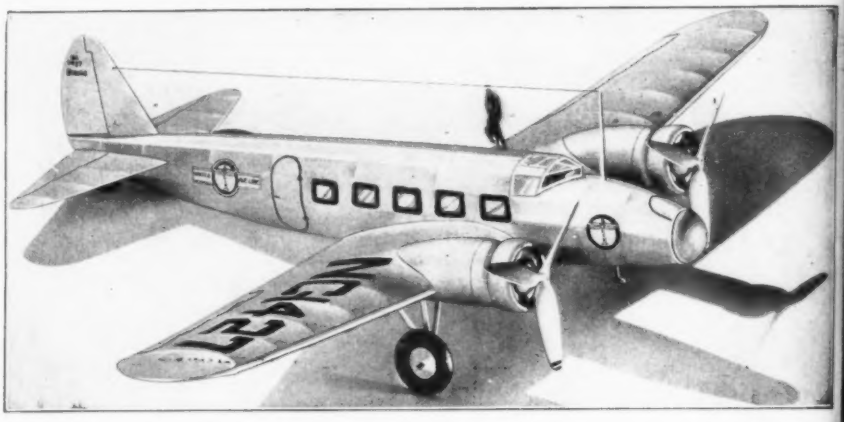
An accurate scale model of the great ships that flew from Italy to the Chicago World's Fair this summer! This is a big, solid non-flying scale model—13½" wing span! Notice the many details in the illustration above. Comet quality throughout, only 75c

THE NEW AERONCA



Here is an easy-to-build model of the plane which holds the world's record for altitude for light planes. 16" wing span..... 75c

THE BOEING TRANSPORT 247



This flying scale represents the big 23" wing span **BOEING TRANSPORT 247 Plane** which is called "The Flying City!" Such features as heat and light plants, a telephone system and other features make the Boeing Transport Wasp-powered plane of United Air Lines the latest thing in design and construction. Complete Kit! Printed balsa rib, bulkhead sheets—longeron strips—sandpaper—rubber motor—balsa leading, trailing edges—1³⁄₃₂" dia. wheels—printed prop. blade outline—silver dope—shred. bamboo—noseblock—cement—banana oil—window cellophane—Boeing insignia, numerals—balsa cylindrical nacelles, engine cowlings—package with washers, prop. shafts, rear hook, bushings, fitting. Two FULL size detailed plans. Jap tissue, waxed tissue $1.50

The FOKKER D7

Flying Scale Model. A fighting plane that everybody's building. 15" wing span 75c

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